

PROCESSES AND SYSTEMS FOR CATALYTIC MANUFACTURE OF WAX ESTER DERIVATIVES

BACKGROUND

1. Technical Field

[0001] Aspects of this document relate generally to systems and processes for reacting and processing wax esters and wax ester derivatives.

2. Background Art

[0002] A wax ester is formed from the chemical reaction of a fatty acid and a fatty alcohol, which results in the formation of an ester group that links two carbon chains. Wax esters are found in various animals and plants, including the jojoba plant (*Simmondsia chinensis*). Wax esters are used in various applications, including in cosmetic and personal care products.

SUMMARY

[0003] Implementations of processes for transesterifying wax esters may include: providing a feedstock including wax esters, contacting the feedstock with a lipase, and catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. An oxidative stability index (OSI) of the transesterified product may be greater than an OSI of the feedstock.

[0004] Implementations of process for transesterifying wax esters may include one, all, or any of the following:

[0005] The transesterified product may include no methyl esters.

[0006] The feedstock may further include an antioxidant and catalytically transesterifying the wax esters in the feedstock with the lipase may further include catalytically transesterifying without one of removing and degrading the antioxidant in the feedstock.

[0007] The feedstock may further include a skin conditioning agent and a volatile compound and catalytically transesterifying the wax esters in the feedstock with the lipase may further include catalytically transesterifying without removing or degrading the skin conditioning agent and the volatile compound in the feedstock.

[0008] The wax esters of the feedstock may be jojoba wax esters.

[0009] The jojoba wax esters may further include hydrogenated jojoba wax esters.

[0010] A dropping point of the transesterified product may be greater than a dropping point of the feedstock and the dropping point may increase as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

[0011] Implementations of a process for transesterifying wax esters may include providing a feedstock including wax esters, contacting the feedstock with a lipase, and

catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. The catalytic transformation may take place at greater than or equal to 98% yield.

[0012] Implementations of processes for transesterifying wax esters may include one, all or any of the following:

[0013] The transesterified product may include no methyl esters.

[0014] The feedstock may further include an antioxidant and catalytically transesterifying the wax esters in the feedstock with the lipase may further include catalytically transesterifying without removing or degrading the antioxidant in the feedstock.

[0015] The wax esters of the feedstock may be jojoba wax esters.

[0016] The jojoba wax esters may further include hydrogenated jojoba wax esters.

[0017] A dropping point of the transesterified product may be greater than a dropping point of the feedstock and the dropping point may increase as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

[0018] Implementations of a process for transesterifying wax esters may include providing a feedstock including jojoba wax esters, contacting the feedstock with a lipase catalyst, and catalytically transesterifying the jojoba wax esters in the feedstock with the lipase to form a transesterified product. The yield of the catalytic transesterification may be greater than 4001 kilograms of product per kilogram of immobilized lipase catalyst.

[0019] Implementations of a process of transesterifying wax esters may include one, all, or any of the following:

[0020] The transesterified product may include no methyl esters.

[0021] The feedstock may further include an antioxidant and catalytically transesterifying the jojoba wax esters in the feedstock with the lipase may further include catalytically transesterifying without removing or degrading the antioxidant in the feedstock.

[0022] The feedstock may further include a skin conditioning agent and a volatile compound and catalytically transesterifying the jojoba wax esters in the feedstock with the lipase may further include catalytically transesterifying without removing or degrading the skin conditioning agent the skin conditioning agent and/or the volatile compound in the feedstock.

[0023] The jojoba wax esters may further include hydrogenated jojoba wax esters.

[0024] A dropping point of the transesterified product may be greater than a dropping point of the feedstock and the dropping point of the transesterified product may increase as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

[0025] The catalytic transesterification may take place at a greater than or equal to 98% yield.

[0026] The foregoing and other aspects, features, and advantages will be apparent to those artisans of ordinary skill in the art from the DESCRIPTION and DRAWINGS, and from the CLAIMS.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Implementations will hereinafter be described in conjunction with the appended drawings, where like designations denote like elements, and:

[0028] FIG. 1 is a flow chart of a conventional chemically catalyzed transesterification process;

[0029] FIG. 2 is a flow chart of an enzymatically catalyzed transesterification process;

[0030] FIG. 3 is a process diagram showing an implementation of three enzymatically catalyzed transesterification reactors in series;

[0031] FIG. 4 is a comparison chart showing the distribution of jojoba wax ester carbon lengths in a transesterified product stream from a jojoba wax ester feedstock for a chemically catalyzed process and an enzyme catalyzed process;

[0032] FIG. 5 is a comparison chart showing the distribution of jojoba wax ester carbon lengths in a transesterified product stream from a jojoba wax ester combined with about 20% by weight of hydrogenated jojoba wax ester feedstock for a chemically catalyzed process and an enzyme catalyzed process;

[0033] FIG. 6 is a comparison chart showing the distribution of jojoba wax ester carbon lengths in a transesterified product stream from a jojoba wax ester combined with about 30% by weight of hydrogenated jojoba wax ester feedstock for a chemically catalyzed process and an enzyme catalyzed process;

[0034] FIG. 7 is a comparison chart showing the distribution of jojoba wax ester carbon lengths in a transesterified product stream from a jojoba wax ester combined with about 50% by weight of hydrogenated jojoba wax ester feedstock for a chemically catalyzed process and an enzyme catalyzed process.

DESCRIPTION

[0035] This disclosure, its aspects and implementations, are not limited to the specific components, assembly procedures or method elements disclosed herein. Many additional components, assembly procedures and/or method elements known in the art consistent with the intended processes and systems for transesterifying wax esters will become apparent for use with particular implementations from this disclosure. Accordingly, for example, although particular implementations are disclosed, such implementations and implementing components may comprise any shape, size, style, type, model, version, measurement, concentration, material, quantity, method element, step, and/or the like as is known in the art for such processes and systems for transesterifying wax esters, and other implementing components and methods, consistent with the intended operation and methods.

[0036] Transesterification involves the process of exchanging acyl groups located on each side of a ester group with an acyl group contained in an alcohol group, as illustrated below:



[0037] Transesterification for naturally occurring or structured or synthetic esters permits altering of various physical properties of the transesterified product when compared to the original feedstock. By non-limiting example, physical properties such as viscosity, dropping point, oil (oxidative) stability index (OSI), carbon chain distribution, and other properties of the transesterified product may be greater, equal to, or less than the corresponding values of the original wax ester-containing feedstocks. These changes take place at least in part because the chain lengths of the resulting ester products are randomized compared to the distribution in the

original wax ester feedstock, which may alter the functionality of the transesterified material in a mixture and/or the thermal properties of the material.

[0038] Conventionally, transesterification of wax esters is accomplished using several different methods. Methods and systems for transesterifying jojoba oil that include the use of an acidic bentonite-type clay at temperatures between 150C – 350C are disclosed in U.S. Patent No. 4,329,298 to Brown, et al., entitled “Isomerization of Jojoba Oil and Products Thereof,” filed August 15, 1980 and issued May 11, 1982 and in U.S. Patent No. 4,360,387 to Brown, et al., entitled “Isomorphous Jojoba Oil Compositions Containing Trans-Isomerized Jojoba Oil,” filed March 9, 1981, issued November 23, 1982, the disclosures of both of which are hereby incorporated entirely herein by reference. When using the process described in the foregoing patents for transesterification, a 5%-10% loss of the original jojoba oil was observed.

[0039] Other conventional transesterification reactions use a chemical catalyst, such as sodium methyllate (methoxide) or sodium hydroxide. While the reaction is catalytic, side reactions between the catalyst and components of the feedstock and/or reactants occur during transesterification process. These side reactions create byproducts that reduce the yield of the process and alter the properties of the transesterified product. Some of the property changes occur because of damage/changes to the feedstock esters caused by the high temperatures (100C – 230C) and low pressures (< 7 mmHg) required to carry out chemical catalytic transesterification. Other property changes occur because these conditions and/or the chemical catalysts themselves degrade, destroy, or reduce the effectiveness of other subcomponents of the wax ester feedstock. Where the wax ester feedstock is derived from a natural source, such as in a jojoba wax ester feedstock, existing antioxidants, sterols, hydrocarbons, and other volatile compounds (volatile in comparison to the volatility of the wax esters) react with the chemical

catalyst in side reactions. The resulting transesterified product may have little or none of any of these components remaining intact following chemical catalytic transesterification and/or may reduce the effectiveness of these components. Furthermore, the transesterified product may include artifacts of these components which are undesirable or have undesirable effects in the product or subsequent mixtures that include the product.

[0040] Chemically catalyzed transesterification of wax esters is carried out in a batch reactor, and the catalyst cannot, accordingly, be recovered for reuse from the transesterification product. Referring to FIG. 1, a process flow diagram for a conventional transesterification process is illustrated. As illustrated, the feedstock containing wax esters is processed in a batch catalytic reaction. Following batch processing, the reaction is stopped using an acid and/or water such as citric acid to neutralize the remaining catalyst. At this point, the reactor contents are then checked for the presence of free fatty acids, which, if present requires the use of a neutralization process for the free fatty acids. The batch reactants are then moved into a waste separation step, in which the solution is washed with soft water to remove soaps and salts in the reactor material and separate them from the oil/lipid portion of the reactor material that contains the transesterified product to form a waste stream and a transesterified product stream. The transesterified product in the transesterified product stream is then bleached to remove remaining color bodies, soaps, and other undesirable byproducts formed during the chemically catalyzed transesterification reaction. The transesterified product stream is then deodorized and votated to produce a finished transesterified product. The process of votation is a controlled crystallization process or tempering process in which the transesterified product is agitated under controlled conditions to form a transesterified product with a desired consistency and crystalline structure

for later use. Votation includes various heating, chilling, flash chilling, and other pressure adjustments to provide the desired consistency and/or structure.

[0041] In this document, various processes for transesterifying wax esters are disclosed that use enzymes to catalytically facilitate the transesterification reaction. In particular implementations, the enzymes are lipases, which are proteins that various biological organisms use to catalyze the hydrolysis and/or esterification of various compounds, such as lipids. As used herein, “lipase” means any enzyme or protein capable of being used in a transesterification reaction of a wax ester.

[0042] Referring to FIG. 2, a process flow diagram for an enzymatically catalyzed transesterification process is illustrated. As illustrated, the wax ester feedstock passes through one or more catalytic reactors that allow a continuous catalytic transesterification reaction to take place. While it is possible to batch process wax ester feedstocks using enzymes, continuous processing has many well-known advantages over batch processing. Following the continuous catalytic transesterification reaction, the transesterified product is deodorized and votated to produce a finished transesterified product stream. As can be observed, there are fewer process steps in an enzymatically catalyzed transesterification process. Furthermore, as will be discussed in detail below, because there are little or no side reactions between the enzyme catalysts and the reactants, while the transesterification results of the enzyme catalyzed process are very similar to chemically catalyzed process, the properties and components of an enzyme catalyzed transesterified product stream differ in important ways while retaining essentially the same functional characteristics.

[0043] Referring to FIG. 3, a process flow diagram of an implementation of a continuous enzymatic reactor system 2 for enzymatic catalyzed transesterification of wax esters is

illustrated. As illustrated, the system 2 includes three reactors 4, 6, 8 connected in series. Each reactor contains the enzyme and is designed to place the incoming wax ester feedstock 10 in contact with the enzyme. Following processing, the transesterified product 12 exits the final reactor 8 for subsequent processing/collection. In particular implementations, the enzyme is immobilized on a substrate material designed to facilitate interaction of the incoming wax ester feedstock. In other implementations, the enzyme is immobilized on the internal structure(s) of the reactor itself or is free flowing within the reactor system and recycled back to the reactor(s). In the implementation illustrated in FIG. 3, the reactors are packed bed reactors. Those of ordinary skill in the art will readily be able to select various reactor components and other piping, pumps, filters, and other process equipment to facilitate the use of the enzymatic reactors using the principles disclosed herein.

[0044] Many different enzymes may be employed in enzymatic catalytic transesterification reactions for wax esters, including those that are derived/obtained from biological organisms, those made synthetically, and those that are entirely artificial, whether made biologically and/or synthetically. For those enzymes that are lipases, these may include, one, some, any, or any combination of lipases derived from the following organisms: *Aspergillus niger*, *Aspergillus oryzae*, *Bacillus subtilis*, *Bacillus thermocatenulatus*, *Burkholderia cepacia*, *Burkholderia glumae*, *Candida rugosa*, *Candida antarctica A*, *Candida antarctica B*, *Candida cylindracea*, *Candida parapsilosis*, *Chromobacterium viscosum*, *Geotrichum candidum*, *Geotrichum sp.*, *Mucor miehei*, *Humicola lanuginosa*, *Penicillium camembertii*, *Penicillium chrysogenum*, *Penicillium roquefortii*, *Pseudomonas cepacia*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas fragi*, *Pseudomonas alcaligenes*, *Pseudomonas mendocina*, *Rhizopus arrhizus*, *Rhizomucor miehe*, *Staphylococcus hyicus*, *Staphylococcus*

aereus, *Staphylococcus epidermidis*, *Staphylococcus warneria*, *Staphylococcus xylosus*, *Thermomyces lanuginosus*, *Aspergillus sp.*, *Bacillus sp.*, *Burkholderia sp.*, *Candida sp.*, *Chromobacterium sp.*, *Geotrichum sp.*, *Mucor sp.*, *Humicola sp.*, *Penicillium sp.*, *Pseudomonas sp.*, *Rhizopus sp.*, *Staphylococcus sp.*, and *Thermomyces sp.*

[0045] In particular implementations, the lipase may be the following: a lipase from *Thermomyces lanuginosus* marketed under the tradenames LIPOZYME TL IM or LIPEX by Novozymes A/S of Bagsvaerd, Denmark and immobilized on a substrate also manufactured by Novozymes. A representative sequence listing of the lipase is included as SEQ ID NO: 1 herein. In other implemenations, the lipase may be that marketed under the tradename NOVOZYM by Novozymes, A/S derived from *Candida antarctica*, a representative sequence listing for which is included as SEQ ID NO: 2 herein. In various implementations, the lipases may be any of the following: those marketed under the tradenames CALB L, NOVOZYME 435, NOVOCOR AD L, AND LIPOLASE 100L by Novozymes; those marketed under the tradenames CALB, CALA, and CRL by c-LEcta, GMBH of Leipzig, Germany; those marketed under the tradenames LIPASE A "AMANO" 12, LIPASE AY "AMANO" 30SD, LIPASE G "AMANO" 50, LIPASE R "AMANO", LIPASE DF "AMANO" 15, LIPASE MER "AMANO", and NEWLASE F by Amano Enzyme Inc. of Nagoya, Japan; those marketed under the tradenames LIPASE MY, LIPASE OF, LIPASE PL, LIPASE PLC/PLG, LIPASE QLM, LIPASE QLC/QLG, LIPASE SL, and LIPASE TL by Meito Sangyo Co., Ltd., of Nagoya, Japan.

[0046] In other implementations, the lipase may be a lipase from *Candida antarctica A*, a lipase from *Candida antarctica B*, *Candida rugosa* or any combination thereof. In various implementations, the lipases may be any disclosed in U.S. Patent Application Publication No. 20140017741 (the '714 publication) to Nielsen, et al., entitled "Esterification Process," filed

October 1, 2013 and published January 16, 2014, the disclosure of which is hereby entirely incorporated herein by reference. Those lipases disclosed in the sequence listings for the various patent applications listed in para. [0026] – [0029] in the ‘741 publication, previously incorporated by reference, each of which applications are hereby entirely incorporated by reference herein, may also be those utilized in particular implementations. In various implementations, the lipases may be those have at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or even at least 99% identity to any of the lipases disclosed herein, in the ‘714 publication, and in the patent applications disclosed in the ‘714 publication, all of which have been previously incorporated by reference.

[0047] A wide variety of wax esters may be processed using the enzymatic catalytic transesterification processes disclosed herein. By non-limiting example, wax esters contained in the following materials may be included in the wax ester feedstocks processed using the principles disclosed herein: beeswax, Chinese wax, shellac wax, whale spermaceti, lanolin, carnauba wax, ouricuri wax, jojoba oil, candelilla wax, esparto wax, Japan wax, rice bran oil, sunflower wax, ozocerite, ozokerite, and montan wax. Any other natural or synthetically produced wax esters may also be processed using the principles disclosed herein. Various examples are discussed in this document regarding wax esters in jojoba oil feedstocks, but these examples are merely given to illustrate the principles disclosed herein.

[0048] Jojoba oil derived from the seeds of the jojoba plant contains wax esters and other components that have been noted to be useful for various functions. These include steryl esters, sterols, and various hydrocarbons that can be useful as skin conditioning agents in cosmetics and personal care products. Antioxidants, like tocopherols, are also included, along with various volatile ingredients naturally present in the oil, which are volatile in comparison with the wax

esters. The wax esters in jojoba oil generally vary between 34 and 48 carbons in length. A detailed analysis of the wax ester distribution, structural characteristics, and other components in jojoba oil may be found in the paper by Thomas K. Miwa, entitled "Structural Determination and Uses of Jojoba Oil," *J. Amer. Oil Chem. Soc.*, Vol. 61, No. 2 (February 1984), p. 407-410, the disclosure of which is hereby incorporated entirely herein by reference. It has been observed that jojoba oil derived from plants from South America, Israel, and North America differ somewhat in chemical composition, but these differences are slight and have not been observed to produce any effect on the product functional characteristics. Details on the composition of jojoba oil from Chile may be found in the article by Cappillino et al., entitled "Composition of Chilean Jojoba Seeds," *Ind. Crops and Prod.*, v. 17, p. 177-182 (2003), the disclosure of which is hereby incorporated entirely herein by reference. Additional information on the differences in jojoba oil produced from jojoba seeds from Chile, North America, Israel, and the rest of South America may be found in the presentation by Cappillino et al., "Composition of Chilean Jojoba Seed," given at the 5th New Crops Symposium in Atlanta, GA Nov 10-13, 2001, a copy of which is included herewith at Appendix B, the disclosure of which is hereby incorporated entirely herein by reference.

[0049] Transesterification of jojoba oil has conventionally been done using the chemically catalyzed processes discussed herein. When such chemical catalyzed processes are used, side reactions form various fatty acid methyl esters and leave various free fatty alcohols when sodium methoxide is used. The resulting transesterified product stream may include 5% or less by weight of these fatty acid methyl esters, which may function as an emollient, and the free fatty alcohols, which may function as an emollient and viscosity controller. As was previously discussed however, the reaction of the chemical catalyst removes or degrades the steryl esters,

sterols, tocopherols, hydrocarbons, and volatile ingredients in the jojoba oil. This degradation and/or removal of these components changes the functionality and physical properties of the transesterified product stream. In particular, the degradation and/or removal of the tocopherols and other naturally occurring antioxidants reduces the OSI of the transesterified product to below the OSI of the original jojoba oil. As jojoba oil includes between about 0 to about 500 ppm of tocopherols with the major component being gamma-tocopherol, elimination of the natural tocopherols has a significant effect on the oxidative stability of the mixture. An addition of 500 ppm of tocopherols can enhance the oxidative stability of the material by about 50% to about 200% of the original oxidative stability.

[0050] Table 1 lists some process parameters and some characteristics of the transesterified product stream for a chemically catalyzed transesterification process and those for an enzymatically catalyzed transesterification process.

Process Parameter	Chemical Catalyst	Enzymatic Catalyst
Reaction Temperature	100C – 230C	10C – 70C
Reaction Pressure	< 7 mm Hg	760 mm Hg (ambient)
Product Color	Increased (changes color)	No changes
Soap Formation	Yes	No change
Transesterification Yield	85% - 95%	>98%

Table 1

[0051] Table 2 shows observed effect of the chemically catalyzed process and various enzymatically catalyzed processes on the various naturally present components in jojoba oil as well as side reaction byproducts.

Transesterified Product Component	Skin Care Formula Function	Chemical Catalyst	Enzyme Catalyst
Steryl Esters	Skin Conditioning Agent	Removed/Degraded	Functionally Unaffected
Sterols	Skin Conditioning Agent	Removed/Degraded	Functionally Unaffected

Tocopherols	Antioxidant	Removed/Degraded	Functionally Unaffected
Hydrocarbons	Skin Conditioning Agent	Removed/Degraded	Unchanged
Fatty Acid Methyl Esters	Emollient	Formed, <5%	Not formed
Free Fatty Alcohols	Emollient, Viscosity Controller	Formed, <5%	Not formed
Volatile Ingredients	Sensory Attributes	Removed/Degraded	Functionally Unaffected

Table 2

[0052] As can be observed from the table, the enzymatic transesterification process takes place at the melting point of the jojoba oil (and any hydrogenated jojoba oil included in the feedstock) under substantially atmospheric pressure. The reaction also proceeds without removing/degrading the tocopherols or volatiles naturally contained in the jojoba oil. Also, the enzyme catalyzed process does not create methyl esters or free fatty alcohols which may limit the applications of the transesterified product as they affect the emollient and/or viscosity behavior of the product. Furthermore, the degradation/removal of the tocopherols in the chemically catalyzed process adversely affects the oxidative stability (measured by the OSI) and accordingly, the shelf life, of the transesterified product. The addition of fatty acid methyl esters creates different material spreading and refractive properties in the chemically transesterified product, even at levels up to about 5% by weight.

[0053] Several examples of chemically catalyzed transesterification reactions compared with enzymatically catalyzed transesterification reactions are disclosed in this document, including in FIGS. 4-7. These will be considered in turn.

Example 1. Chemical Catalytic Batch Process vs. Enzymatically Catalyzed Batch Process

[0054] A 1 liter 3-necked glass flask equipped with an agitating blade was loaded with 800 g of refined jojoba oil. The oil was heated to 110 C and dried under vacuum for 30 minutes. After drying was completed, a small amount of sodium methyate (0.3% by weight) was added to the mixture. The transesterification reaction was agitated under vacuum at 120C for two hours. The catalyst was then neutralized with 1 g of citric acid and then treated with a silica and bleaching clay mixture to remove color induced by the reaction and other residual impurities. The transesterified product was a yellow liquid.

[0055] A 2 liter jacketed glass reactor equipped with an agitating blade was loaded with 1.2 kg of refined jojoba oil and 48 g (4% by weight) of LIPOZYME TL IM (*Thermomyces lanuginosus* lipase) from Novozymes. A layer of nitrogen was blanketed over the oil and the mixture was agitated at ambient temperature. After five hours, the lipase was removed from the mixture and the jojoba derivative was analyzed. The transesterified product was a slightly yellow liquid similar in texture and color to the initial feedstock. Measurement of the wax ester distributions for the feedstock and both transesterified products was done using an Hewlett Packard GC 5980 Series II gas chromatograph with a Restek MxT-65TG 30 meter, 0.25 mm ID capillary chromatographic column with a Crossbond 65% diphenyl/35% dimethyl polysiloxane film thickness of 0.1 microns. The gas chromatograph has split/splitless injection and uses an FID detector. Operating parameters of the gas chromatograph were as follows: injection port: 300C, detector: 325C, split ratio: 100:1, 1 microliter injection with oven temperature ramping from 280C to 350C over 20 minutes. Helium carrier gas was used. The concentration of tocopherols was measured using HPLC rather than the gas chromatograph. The equipment used was an Agilent LC 1100 series with an autosampler, quaternary pump, diode array detector

(DAD), and an Alltech 2000 ELSD operating with a drift tube temperature of 40.0 °C with 1.7 mL/min Nitrogen. The column used was an Agilent RX-SIL 4.6 x 50mm 1.8um normal phase silica column kept at 40.0 °C. The DAD was set to detect UV at wavelengths 210 nm and 295 nm to identify the optically active portion of the tocopherols as they eluted from the column. The mobile phase consisted of an isocratic flow of 98% hexane and 2% isopropanol at 0.5 mL/min with a total run time of 15.00 minutes. Table 3 summarizes the results of both experiments.

Components	Feedstock Composition	Chemical Catalyst	% Change	Enzyme Catalyst	% Change
Tocopherols	0.04%	0.00%	-0.04%	0.04%	0.00%
Fatty Acid Methyl Esters	0.00%	3.10%	3.10%	0.00%	0.00%
Free Fatty Alcohols	0.00%	1.80%	1.80%	0.00%	0.00%
OSI (hours)	26.5	21.5	-18.87%	38.6	45.66%
Wax Ester Content	98.00%	93.10%	-4.90%	98.00%	0.00%
Wax Ester Distribution					
C36:1	1.12%	1.30%	0.180%	1.20%	0.080%
C38:2	6.02%	4.90%	-0.120%	4.80%	-1.220%
C40:2	27.95%	35.76%	7.810%	34.34%	6.390%
C42:2	50.28%	40.64%	-9.640%	40.92%	-9.360%
C44:2	9.94%	13.75%	3.811%	14.93%	4.991%
C46:2	1.20%	1.89%	0.690%	2.23%	1.030%

Table 3

[0056] Examining the results shows that the formation of fatty acid methyl esters and free fatty alcohols in the chemically catalyzed transesterification reaction produces a product with a lower wax-ester percentage than the original starting material. The results also indicate that the chemically catalyzed reaction destroys the original amount of tocopherols present in the feedstock, which reduces the OSI of the transesterified product. Surprisingly, however, the OSI of the enzymatically catalyzed transesterified product is greater than that of the feedstock. This

result indicates that the enzymatic catalysis has an unexpected positive effect on OSI that is not explainable simply by the enzymatic catalyst preserving the natural tocopherols originally present in the feedstock during the reaction. The OSI was measured using an Omnion Scientific Services machine, Model OSI-8-110, according to the procedures set forth in the American Oil Chemist's Society (AOCS) Official Method Cd 12b-92, a copy of which is submitted herewith as Appendix A and incorporated entirely herein by reference.

[0057] In all of the above examples, no significant difference in the viscosity between the chemically catalyzed and the enzymatically catalyzed transesterified products was observed.

[0058] The chemically catalyzed and enzymatically catalyzed transesterified products were tested for performance in a typical cream formulation. Each cream formulation used 3% by weight of each transesterified product (chemically or enzymatically catalyzed) created in the previous experiment. Table 4 shows the formulation details of the cream along with the components and suppliers. Following Table 4 is the mixing procedure used.

Phase	Tradename	International Nomenclature Cosmetic Ingredient (INCI)	Supplier	Weight percent % (of total)
A	Deionized Water	Water	-	66.27
	VERSENE Na2 Crystals	Disodium EDTA	The Dow Chemical Co.	0.03
B	Glycerin, USP	Glycerin	The Dow Chemical Co.	5.00
	KELTROL CG-T	Xanthan Gum	CP Kelco	0.30
C	FLORAMAC Macadamia Oil.	<i>Macadamia integrifolia</i> seed oil.	Floratech	3.00
	FLORAESTERS 30	Joboba Esters (and) Tocopherol	Floratech	3.00
	Transesterified Wax Esters	Joboba Derivative being examined	-	3.00
	Cocoa Butter	<i>Theobroma cacao</i> (Cocoa) seed butter	Cognis Corporation	5.00

	FLORASUN 90	<i>Helianthus annuus</i> (Sunflower) seed oil (and) Tocopherol	Floritech	2.00
	BOTANISIL CP-33	Cyclopentasiloxane	Botanigenics, Inc.	4.00
	DOW CORNING 200 Fluid	Dimethicone	Dow Corning Corporation	0.50
	LEXEMUL 561	Glyceryl Stearate (and) PEG-100 Stearate	Inolex Chemicals	4.00
	EMULGADE PL	Cetearyl Glucoside (and) Cetearyl Alcohol	Cognis Corporation	3.00
D	PHENONIP	Phenoxyethanol (and) Methylparaben (and) Ethylparaben (and) Butylparaben (and) Propylparaben (and) Isobutylparaben	Clariant Corporation	0.90
			Total	100

Table 4

[0059] The cream was prepared as follows: Step 1: Dissolve the VERSENE Na₂ crystals into the deionized water with stirring at 75C to form phase A. Step 2: Mix the KELTROL CG-T in the glycerin USP to form phase B. Add phase A to phase B with rapid stirring to form phase AB. Step 3: Combine all ingredients of phase C and 75C using propeller agitation. Add phase C to phase AB at 75C using propeller agitation to form phase ABC. Step 4: Reduce the temperature of the cream to 50C and add phase D to phase ABC with propeller agitation. Cool the batch with moderate agitation to room temperature.

[0060] Table 5 summarizes the viscosity and appearance differences between the two cream formulations. While a viscometer can be used to measure the viscosity of such materials,

the test used to calculate the viscosities, a method of calculating the viscosity without a viscometer, includes placing a sample weighting 0.5 g on a piece of horizontally oriented paper and drawing a starting line immediately next to the sample. The paper is then oriented vertically for 30 seconds and then laid flat again. A line is then drawn at the edge of where the sample has finished flowing down the paper. A ruler is then used to measure the distance between the starting line and the ending line. By developing a calibration curve for this method using materials of known viscosity and measuring the length of travel down the paper, a correlation can be developed between the length of travel of the material and the viscosity of the material.

Transesterified Product Type in Cream	Viscosity	Appearance
Chemically Catalyzed	120,900 cP	White, semi-solid phase
Enzymatically Catalyzed	78,585 cP	White, liquid phase, glossy

Table 5

[0061] Table 5 indicates that the use of enzymatically catalyzed transesterified jojoba oil created a cream formulation that had a viscosity drop of nearly 35% from the viscosity of the chemically catalyzed cream. This data indicates that the enzymatically catalyzed transesterified jojoba oil has the functional effect of lowering the resulting product viscosity compared to chemically catalyzed product. The difference in appearance between the two cream formulations (i.e., the enzymatically catalyzed product having less shine and gloss when applied to a surface) is due the relative abundance of fatty acid methyl esters in the chemically catalyzed product.

Example 2. Continuous Flow Enzymatically Catalyzed Transesterification Using Lipase

[0062] A 10 cm X 100 cm stainless steel cylinder was filled with 0.5 kg of LIPOZYME TL IM immobilized on substrates. The cylinder was equipped with mesh screening material on both ends to secure the enzyme substrates and was sealed and conditioned by evacuating the catalyst of excess moisture and salts used in the enzyme manufacturing process. The cylinder

was connected to a metering pump and a pressure gauge monitored by a solenoid that automatically shut down flow if the pressure at the entrance to the cylinder rose above 15 psi. Flow rate was calculated by the rate of conversion obtained from batch reactions using the same enzymatic catalyst and was 0.8 kg/hr. A stock of refined jojoba oil was fed to the reactor cylinder at a constant temperature and pressure, as the cylinder was submerged in a water bath to keep the reactor temperature constant. The resulting product exiting the cylinder was slightly yellow and liquid at room temperature. The properties of the transesterified product produced are summarized in Table 6.

Components	Feedstock Composition	Enzymatically Catalyzed	% Change
Tocopherols	0.04%	0.04%	0.00%
Fatty Acid Methyl Esters	0.00%	0.00%	0.00%
Free Fatty Alcohols	0.00%	0.00%	0.00%
OSI (hours)	26.5	36.2	36.6%
Wax Ester Content	98%	98%	0%
Wax Ester Distribution			
C36:1	1.12	1.20	0.080%
C38:2	6.02	4.91	-1.110%
C40:2	27.95	35.30	7.350%
C42:2	50.28	41.20	-9.080%
C44:2	9.94	14.79	4.851%
C46:2	1.2	2.14	0.940%

Table 6

[0063] As can be observed, the continuous process created a fully randomized transesterified jojoba oil product that reached full conversion before exiting the reactor. Again, the increase in OSI from the feedstock material was again surprisingly noted. The transesterified product in this example was included in a cream formulation like that in Table 4 and similar visual appearance and viscosity results to the enzymatically catalyzed cream in Table 5 were observed.

Example 3. Continuous Enzymatically Catalyzed Transesterification Using Jojoba Oil and Hydrogenated Jojoba Oil.

[0064] The same experimental system as in Example 2 was used but modified to operate at 70C in order to maintain a homogenous feedstock mixture of jojoba oil and hydrogenated jojoba oil entering the reactor in the feedstock. Various additional background information on the structure, use, and of transesterification reactions using hydrogenated jojoba wax esters may be found in the articles by James Brown and Robert Kleiman “*Trans* Isomers in Cosmetics”, Parts 1 and 2, *Soap & Cosmetics*, May 2001, p. 33-36 and June 2001, as well as in Sessa et al., “Differential Scanning Calorimetry Index for Estimating Level of Saturation in Transesterified Wax Esters,” *J. Amer. Oil Chem. Soc.*, v. 73, 271-273 (1996), and David J. Sessa, “Derivation of a Cocoa Butter Equivalent from Jojoba Transesterified Ester via a Differential Scanning Calorimetry Index,” *J. Sci. Food Agric.*, v. 72, p. 295-298 (1996) the disclosures of all of which are hereby entirely incorporated herein by reference.

[0065] Because of the absence of unsaturated wax esters in the hydrogenated jojoba wax esters (HJW), the progress of the reaction can be measured by observing the formation of monounsaturated wax esters during the reaction. The dropping point, or the temperature at which the transesterified product transitions from a semi-solid to a liquid state, was also monitored. The dropping point was calculated using the method outlined in ASTM D127-63. The results of the processing, with a comparison to a feedstock containing no hydrogenated jojoba wax esters, are included in Table 7.

Components	Feedstock Composition	0% HJW	20% HJW	30% HJW
Tocopherols	0.04%	0.04%	0.04%	0.04%
Fatty Acid Methyl Esters	0.00%	0.00%	0.00%	0.00%
Free Fatty	0.00%	0.00%	0.00%	0.00%

Alcohols				
Wax Ester Content	98%	98%	98%	98%
% Monounsaturated Wax Ester	3	3	31.98	41.50
% Conversion	N/A	99.96%	100.55%	100.01%
Dropping Point (degrees C)	8	8	44	49

Table 7

[0066] The percent conversion in Table 7 was calculated based on ideal monounsaturated wax ester values derived from the fatty acid and fatty alcohol proportions of the feedstock. These proportions (and the other wax ester distribution data in this document) were determined using the Hewlett Packard gas chromatograph disclosed herein and a solvent to solubilize the samples. During testing, approximately 1 drop of sample was diluted with 10 drops of solvent and 1.0 uL of the resulting mixture was injected into the gas chromatograph. Based on historical data for jojoba wax esters previously obtained and a theoretical randomization of the percentage of the various chain lengths (assuming all esters were transesterified), an ideal value for each wax ester species (i.e., C36:2, C42:2, etc.) can be determined. Since the C42:2 ester is the one that has the largest change from pre- to post-transesterification, it is the one used in Example 3 to monitor conversion of the reactants. The ideal percentage of C42:2 in pure jojoba oil is 41.28% following a complete and total randomization. Accordingly, the conversion of pure jojoba oil can be calculated as:

$$\% \text{ Conversion HJW0} = (\% \text{ C42:2}) / 41.28 \times 100$$

[0067] Where HJW0 is a jojoba oil feedstock that does not contain any hydrogenated jojoba wax esters. For the feedstocks that include hydrogenated jojoba oil and wax esters, the percent conversion is monitored by the formation of the monounsaturated species. The species

monitored in these reactions include C38:1, C40:1, C42:1, C44:1, and C46:1. The same gas chromatographic procedures used in this document are used to monitor the various reactants during and following the transesterification reaction. Table 8 contains the ideal overall values for monounsaturated wax esters (representing all the individual species percentages added together) for a feedstock containing 20%, 30%, and 50% hydrogenated jojoba wax esters (HJW20, HJW30, and HJW50, respectively).

Product	Ideal % of Monounsaturated Wax Esters
HJW20	31.20
HJW30	40.00
HJW50	46.50

Table 8

[0068] These values can be used to calculate the percent conversion of jojoba wax esters to the ideal mixture of monounsaturated wax esters given the percentage of the monounsaturated components by weight in the feedstock. The calculation is given as follows:

$$\% \text{ Conversion} = (\% \text{ Monounsaturates}) / (\text{Ideal \% Monounsaturates}) \times 100$$

[0069] Because of the nature of the calculation it is possible for the calculation to be greater than 100% depending upon measurement results and the fact that the ideal number is based on historical average data for jojoba oil.

[0070] Referring to FIGS. 4-7, various comparison graphs of wax ester distributions for chemically catalyzed transesterified and enzyme catalyzed transesterified jojoba wax esters are illustrated. FIG. 4 is for a pure jojoba oil product (HJW0). The solid line shows the wax ester distribution for the chemically catalyzed process and the dotted line shows the wax ester distribution for the enzymatically catalyzed process. By observation, it is clear that the enzymatically catalyzed process successfully randomizes the various esters very similarly to the chemically catalyzed process. FIGS. 5, 6, and 7 show the wax ester distributions for

transesterification products that have 20%, 30%, and 50% by weight hydrogenated jojoba wax esters added in, respectively. The similarity between the solid lines (chemical) and dotted (enzyme) demonstrate how the conversion rates of the enzymatic catalyzed process track those of the chemical catalyzed process. The differences between the two processes may contribute in part to the differences in functional performance and physical properties of the enzymatically catalyzed processed material from the chemically catalyzed material.

[0071] Lipases like those disclosed herein are conventionally used for processing triglycerides, and some have been specifically selected for processing triglycerides in particular ways. For example, some lipases are known as 1, 3 specific as they are capable of scissioning the alkyl esters in the 1 and 3 positions in a triglyceride while not affecting the alkyl ester at the 2 position. Such a lipase interacts with the triglyceride molecule on the exterior of the lipase surface. Other lipases operate when the alkyl ester is inserted into the lipase molecule itself. Obviously, 1, 3 lipases will differ in their ability to process various triglyceride molecules based on the structure of the alkyl esters and the triglyceride molecule due to various factors, including steric hindrance and other steric effects.

[0072] Interestingly, both 1, 3 lipases and lipases that operate using insertion of a triglyceride work equally well when used in jojoba ester transesterification reactions. This result is unexpected, as these lipases sterically interact quite differently with the molecules they are involved in catalyzing. Without being bound by any theory, it is possible that because a jojoba ester is primarily a long carbon chain without much molecular bending due to the ester group, both 1, 3 lipases and lipases that operate using insertion are able to interact sterically with the jojoba esters in ways that produce substantially the same catalytic effect. In other words, the long chain jojoba ester can fit into the opening in an insertion lipase and also slide into the active

areas of a 1, 3 lipase. As this processing characteristic for lipase catalytic processing of jojoba wax esters is not a predictable result, this illustrates a unique aspect of processing jojoba wax esters using lipases.

[0073] Furthermore, conventional processing of triglycerides using lipases typically yields up to 4000 kg of product per kg of catalyst before the catalyst must be replaced. A wide variety of factors are attributed to the eventual denaturing of the catalyst, including gumming and contamination of the catalyst with water in the triglyceride feedstock. An example of a conventional transesterification process of a triglyceride vegetable oil feedstock may be found in U.S. Patent Application Publication No. 20130149414 to Favre et al., entitled "Processing of Vegetable Oils," filed June 28, 2011, and published June 13, 2013, the disclosure of which is incorporated entirely herein by reference. Testing using continuous flow reactors containing immobilized lipases on substrates demonstrated 96 days of 100% conversion using 0.46 kg of catalyst in each column. At the conclusion of this time period at which the catalyst needed to be replaced, 2305.15 kg of product was produced, which resulted in a kg of product to kg of catalyst ratio of 5011. This ratio of kg of product to kg of immobilized catalyst is over 20% greater than the ratio when the same lipase is used for triglyceride production. This result when the lipase is used for catalytic transesterification of jojoba oil significantly exceeds the conventional expectations for the lipase, and is an unexpected result that is not predicted by the results of conventional enzymatic triglyceride processing. In various implementations, the yield of an enzymatically transesterified wax ester reaction may yield least 4001 kg product/kg immobilized catalyst, at least 4100 kg product/kg immobilized catalyst, at least 4200 kg product/kg immobilized catalyst, at least 4300 kg product/kg immobilized catalyst, at least 4500 kg product/kg immobilized catalyst, at least 4700 kg product/kg immobilized catalyst, at least 48000

kg product/kg of immobilized catalyst, at least 4900 kg product/kg of immobilized catalyst, or even at least 5000 kg product/kg of immobilized catalyst.

[0074] In places where the description above refers to particular implementations of enzymatic catalytic transesterification systems, processes, and implementing components, sub-components, methods and sub-methods, it should be readily apparent that a number of modifications may be made without departing from the spirit thereof and that these implementations, implementing components, sub-components, methods and sub-methods may be applied to other enzymatic catalytic transesterification systems and processes.

CLAIMS

What is claimed is:

1. A process for transesterifying wax esters, the process comprising:
providing a feedstock comprising wax esters;
contacting the feedstock with a lipase;
catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product;
wherein an oxidative stability index (OSI) of the transesterified product is greater than an OSI of the feedstock.
2. The process of claim 1, wherein the transesterified product comprises no methyl esters.
3. The process of claim 1, wherein the feedstock further comprises an antioxidant and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the antioxidant in the feedstock.
4. The process of claim 3, wherein the feedstock further comprises a skin conditioning agent and a volatile compound and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the skin conditioning agent and the volatile compound in the feedstock.
5. The process of claim 1, wherein the wax esters of the feedstock are jojoba wax esters.

6. The process of claim 5, wherein the jojoba wax esters further comprise hydrogenated jojoba wax esters.

7. The process of claim 6, wherein a dropping point of the transesterified product is greater than a dropping point of the feedstock and the dropping point of the transesterified product increases as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

8. A process for transesterifying wax esters, the process comprising:
- providing a feedstock comprising wax esters;
- contacting the feedstock with a lipase;
- catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product;
- wherein the catalytic transesterification takes place at greater than or equal to 98% yield.
9. The process of claim 8, wherein the transesterified product comprises no methyl esters.
10. The process of claim 8, wherein the feedstock further comprises an antioxidant and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the antioxidant in the feedstock.
11. The process of claim 8, wherein the wax esters of the feedstock are jojoba wax esters.
12. The process of claim 11, wherein the jojoba wax esters further comprise hydrogenated jojoba wax esters.
13. The process of claim 12, wherein a dropping point of the transesterified product is greater than a dropping point of the feedstock and the dropping point of the transesterified product increases as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

14. A process for transesterifying wax esters, the process comprising:
- providing a feedstock comprising jojoba wax esters;
- contacting the feedstock with a lipase catalyst;
- catalytically transesterifying the jojoba wax esters in the feedstock with the lipase to form a transesterified product;
- wherein a yield of the catalytic transesterification is greater than 4001 kilograms of product per kilogram of immobilized lipase catalyst.
15. The process of claim 14, wherein the transesterified product comprises no methyl esters.
16. The process of claim 14, wherein the feedstock further comprises an antioxidant and catalytically transesterifying the jojoba wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the antioxidant in the feedstock.
17. The process of claim 16, wherein the feedstock further comprises a skin conditioning agent and a volatile compound and catalytically transesterifying the jojoba wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the skin conditioning agent and the volatile compound in the feedstock.
18. The process of claim 14, wherein the jojoba wax esters further comprise hydrogenated jojoba wax esters.

19. The process of claim 18, wherein a dropping point of the transesterified product is greater than a dropping point of the feedstock and the dropping point of the transesterified product increases as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

20. The process of claim 14, wherein the catalytic transesterification takes place at a greater than or equal to 98% yield.

ABSTRACT

[0075] Processes for transesterifying wax esters. Implementations may include: providing a feedstock including wax esters, contacting the feedstock with a lipase, and catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. An oxidative stability index (OSI) of the transesterified product may be greater than an OSI of the feedstock.

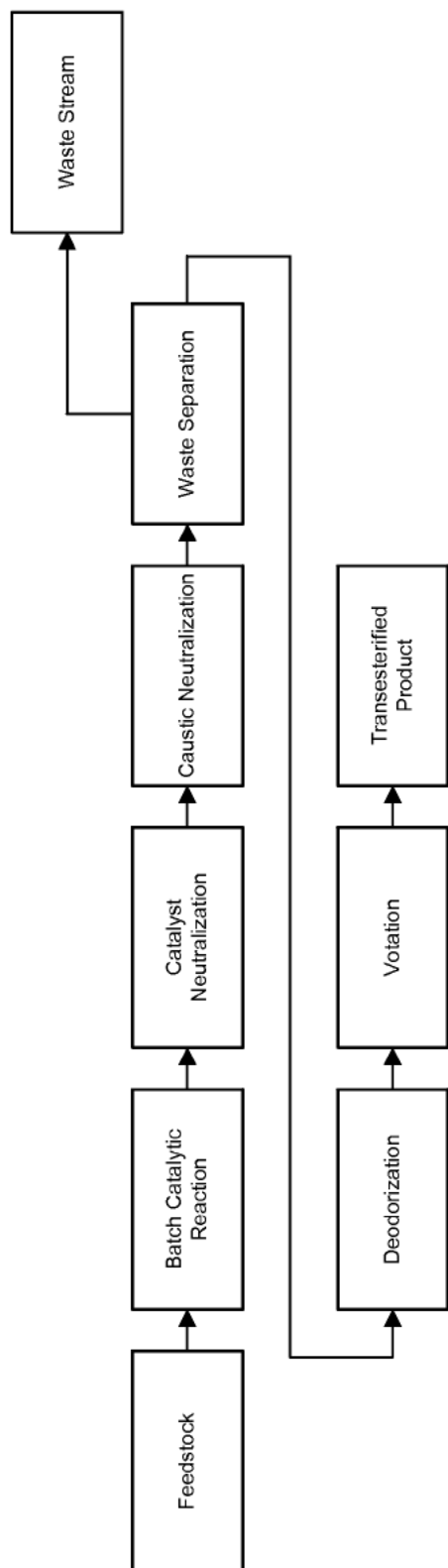


FIG. 1

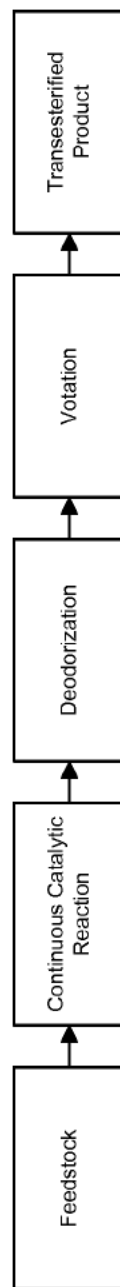


FIG. 2

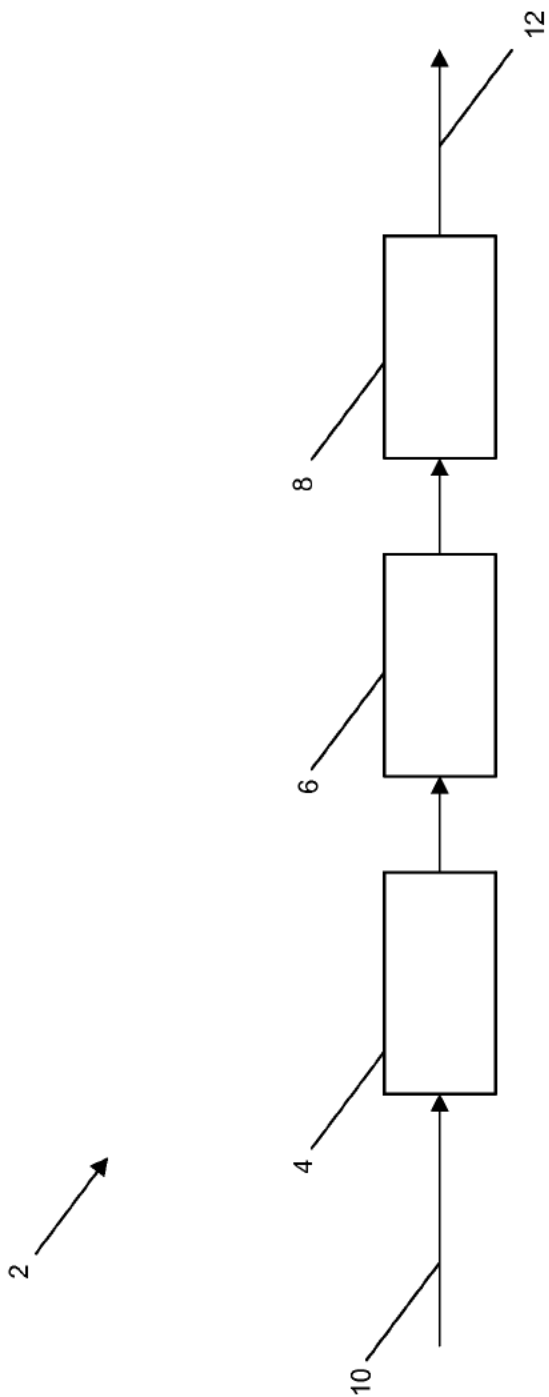


FIG. 3

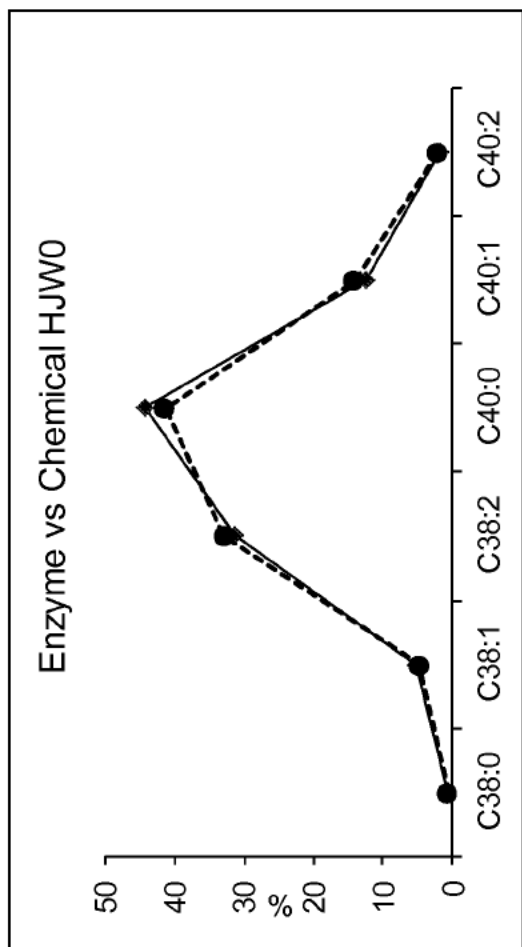


FIG. 4

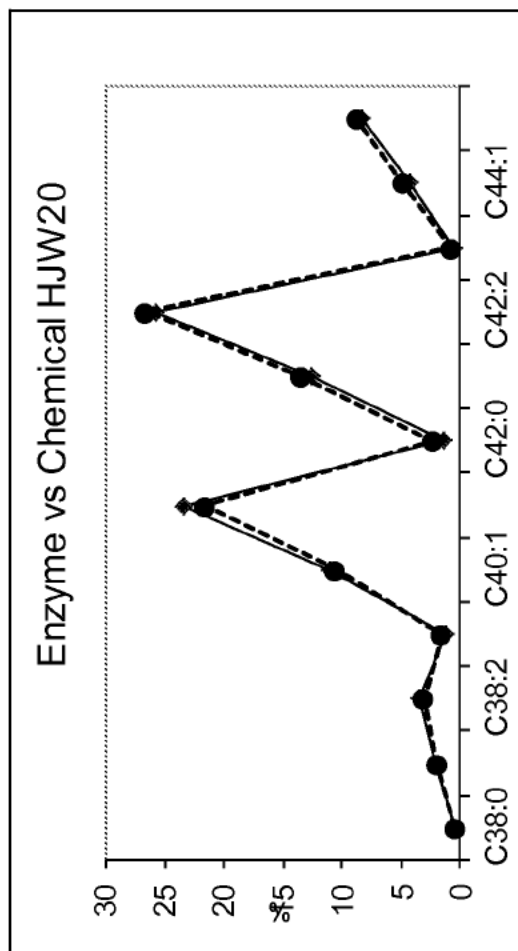


FIG. 5

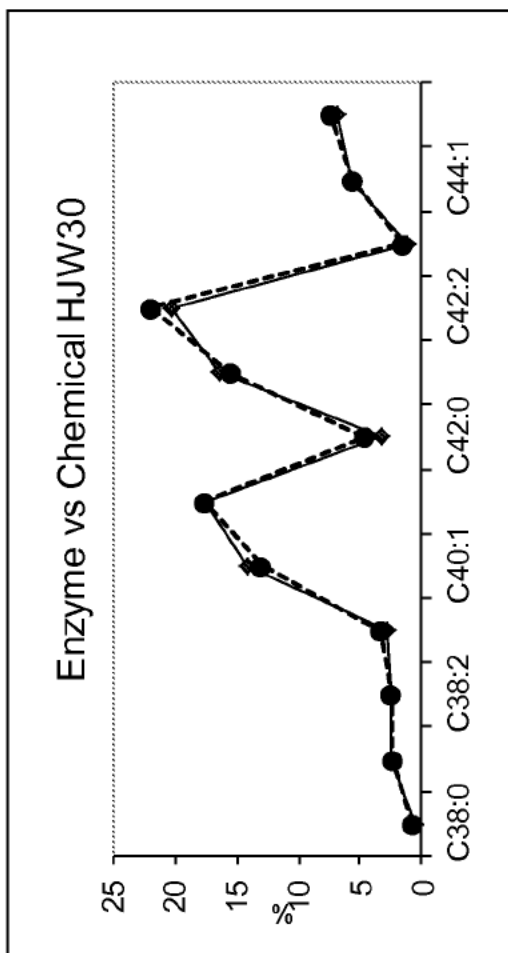


FIG. 6

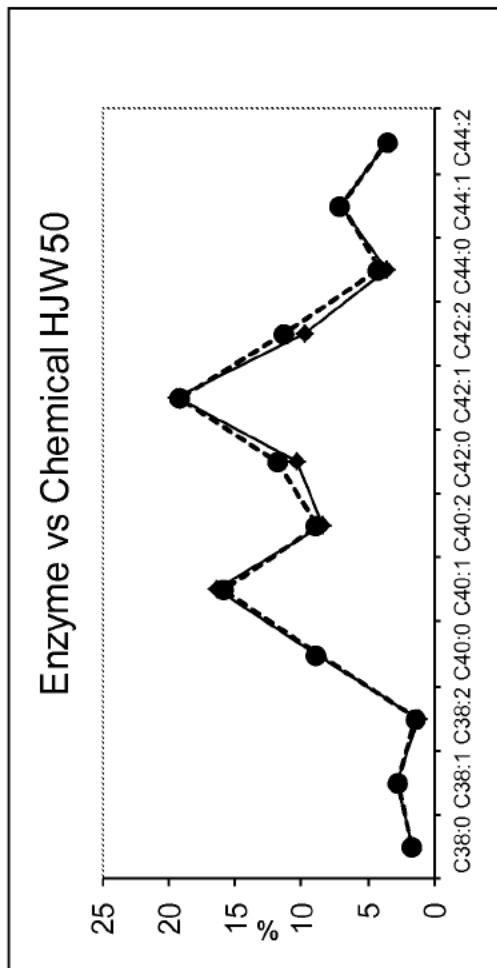


FIG. 7

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	FloraTech002
		Application Number	
Title of Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor 3					Remove
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	James	H.	Brown		
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		FloraTech002	
		Application Number			
Title of Invention		Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives			
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Title of the Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives		
Attorney Docket Number	FloraTech002	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	

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For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country i

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	FloraTech002
		Application Number	
Title of Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives		

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Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
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Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	FloraTech002
		Application Number	
Title of Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives		

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. ☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
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If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application. In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application. In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	FloraTech002
	Application Number	
Title of Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives	

Applicant 1				Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.					
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	FloraTech002
		Application Number	
Title of Invention	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives		

Prefix	Given Name	Middle Name	Family Name	Suffix

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First Name	Adam	Last Name	Stephenson	Registration Number
			58349	

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This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives			
First Named Inventor/Applicant Name:	Jeff Addy			
Filer:	Adam Reid Stephenson			
Attorney Docket Number:	FloraTech002			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Vantage Exhibit 1002

Page 45 of 1215

CARGILL 00000070

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				730

Electronic Acknowledgement Receipt

EFS ID:	21025664
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson
Filer Authorized By:	
Attorney Docket Number:	FloraTech002
Receipt Date:	19-DEC-2014
Filing Date:	
Time Stamp:	19:12:13
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$730
RAM confirmation Number	6639
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Vantage Exhibit 1002

Page 47 of 1215
CARGILL 00000072

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	UtilityApplication002.pdf	199124	no	33
			f7df5e214ec063791d5658067993d1f9a6c78a2d		
Warnings:					
Information:					
2	Drawings-only black and white line drawings	PTODrawings002.pdf	76497	no	4
			dfc7f5ca798eaea1940560708737edfe52de585d		
Warnings:					
Information:					
3	Application Data Sheet	ADS002.pdf	1894804	no	7
			c1d76e71af20721e44799a7a70af456ff2462213		
Warnings:					
Information:					
4	Appendix to the Specification	AppendixA.pdf	887524	no	5
			542d8d234bb9d0f6f688b5c7c2849cd6263dc8b3		
Warnings:					
Information:					
5	Appendix to the Specification	AppendixB.pdf	16457751	no	19
			47b6b11efdc2cae60e5bc6124a35d5e95016b5e8		
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	34636	no	2
			de02be4f05aef3a63124b1a28268cec39431ae73		
Warnings:					
Information:					
Total Files Size (in bytes):			19550336		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
14/578,075	12/19/2014	1615	730	FloraTech002	20	3

CONFIRMATION NO. 2053

93756

Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

FILING RECEIPT



OC000000072745232

Date Mailed: 01/09/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Jeff Addy, Chandler, AZ;
Clay Daly, Chandler, AZ;
James H. Brown, Chandler, AZ;

Applicant(s)

International Flora Technologies, Ltd., Chandler, AZ

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 01/08/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/578,075**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

**** SMALL ENTITY ****

Title

Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

Preliminary Class

424

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/578,075	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	730		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/578,075	12/19/2014	Jeff Addy	FloraTech002

CONFIRMATION NO. 2053

FORMALITIES LETTER



OC000000072745233

93756

Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

Date Mailed: 01/09/2015

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing.

Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.

The surcharge is due for any one of:

- late submission of the basic filing fee, search fee, or examination fee,
- late submission of inventor's oath or declaration,
- filing an application that does not contain at least one claim on filing, or
- submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. Small entity discount is in effect. If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$ 70 surcharge.
- \$(0) previous unapplied payment amount.
- \$ 70 TOTAL FEE BALANCE DUE.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):

Jeff Addy
Clay Daly
James H. Brown

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/ldvan/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

SCORE Placeholder Sheet for IFW Content

Application Number: 14578075

Document Date: 01/13/2015

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Sequence Listing

At the time of document entry (noted above):

- USPTO employees may access SCORE content via eDAN using the Supplemental Content tab, or via the SCORE web page.
- External customers may access SCORE content via PAIR using the Supplemental Content tab.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2015-01-13
	First Named Inventor	Jeff Addy	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	FloraTech002	

U.S.PATENTS							Remove	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	4329298		1982-05-11	Brown et al.			
	2	4360387		1982-11-23	Brown et al.			
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S.PATENT APPLICATION PUBLICATIONS							Remove	
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	20130149414		2013-06-13	Favre et al.			
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button							Add	
NON-PATENT LITERATURE DOCUMENTS							Remove	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2015-01-13
First Named Inventor	Jeff Addy	
Art Unit		
Examiner Name		
Attorney Docket Number	FloraTech002	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Sessa et al., "Differential Scanning Calorimetry Index for Estimating Level of Saturation in Transesterified Wax Esters," J. Amer. Oil Chem. Soc., v. 73, 271-273 (1996)	☐
	2	James Brown et al., "Trans Isomers in Cosmetics," Part 2, Soap & Cosmetics, May 2001, p. 33-36, and June 2001	☐
	3	James Brown et al., "Trans Isomers in Cosmetics," Soap & Cosmetics, May and June 2001	☐
	4		☐
	5		☐
	6		☐
	7	Patrick Cappillino et al., "Composition of Chilean Jojoba Seed," presentation given at the 5th New Crops Symposium in Atlanta, GA Nov. 10-13, 2001	☐
	8	Patrick Cappillino et al., "Composition of Chilean Jojoba Seeds," Ind. Crops and Prod., v. 17, p. 177-182 (2003)	☐
	9	Avery Sengupta et al., "Comparative Study of Sterol Ester Synthesis using Termomyces Lanuginosus Lipase in Stirred Tank and Packed-Bed Bioreactors," J. Am Oil Chem Soc, Vol. 87, p. 1019-1025 (2010)	☐
	10	Jose A. Arcos et al., "Continuous Enzymatic Esterification of Glycerol with (Poly)Unsaturated Fatty Acids in a Packed-Bed Reactor," Biotechnology and Bioengineering, Vol. 68, No. 5, p. 563-570 (June 5, 2000)	☐

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2015-01-13
First Named Inventor	Jeff Addy	
Art Unit		
Examiner Name		
Attorney Docket Number	FloraTech002	

11	Aran H-Kittikun et al., "Continuous production of monoacylglycerols from palm olein in packed-bed reactor with immobilized lipase PS," Biochemical Engineering Journal 40, p. 116-120 (2008)	☐
12	Anders Falk Vikbjerg et al., "Continuous Production of Structured Phospholipids in a Packed Bed Reactor with Lipase from Thermomyces lanuginosa," AOCS, Vo. 82, No. 4 (2005)	☐
13	Sarah M. Meunier, "Development of a Packed-bed Reactor Containing Supported Sol-gel Immobilized Lipase for Transesterification," A thesis presented to the Univ. of Waterloo (2012)	☐
14	Roberta Claro da Silva et al., "Interesterification of Lard and Soybean Oil Blends Catalyzed by Immobilized Lipase in a Continuous Packed Bed Reactor," J. Am. Oil Chem. Soc., Vol. 88, p. 1925-1933 (2011)	☐
15	Roberta Claro da Silva et al., "Microstructure and Thermal Profile of Structured Lipids Produced by Continuous Enzymatic Interesterification," J. Am. Oil Chem. Soc., Vol. 90, p. 631-639 (2013)	☐
16	Ozmutlu et al., "Numerical Simulation of Fluid Flow and Enzyme Catalysed Substrate Conversion in a Packed-bed Enzyme Reactor," Proc. Appl. Math. Mech. 3, p. 398-399 (2003)	☐
17	X. Xu et al., "Production of Specific-Structured Lipids by Enzymatic Interesterification in a Pilot Continuous Enzyme Bed Reactor," AOCS, Vol. 75, No. 11 (1998)	☐
18	Xuebing Xu et al., "Production of Structured Lipids in a Packed-Bed Reactor with Thermomyces lanuginosa Lipase," AOCS, Vol. 79, No. 6 (2002)	☐
19	"Design of Ideal Plug Flow Reactors (PFRs) operated at Steady State under Isothermal Conditions," CP303, Set #4 (July-October 2013)	☐
20	"Fixed-Bed Catalytic Reactors," Copyright 2011 by Nob Hill Publishing, LLC	☐
21	Neha R. Sonare et al., "Transesterification of used sunflower oil using immobilized enzyme," Journal of Molecular Catalysis B: Enzymatic 66, p. 142-147 (2010)	☐

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2015-01-13
First Named Inventor	Jeff Addy
Art Unit	
Examiner Name	
Attorney Docket Number	FloraTech002

If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2015-01-13
First Named Inventor	Jeff Addy
Art Unit	
Examiner Name	
Attorney Docket Number	FloraTech002

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Adam R. Stephenson/	Date (YYYY-MM-DD)	2015-01-13
Name/Print	Adam R. Stephenson	Registration Number	58349

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14578075			
Filing Date:	19-Dec-2014			
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives			
First Named Inventor/Applicant Name:	Jeff Addy			
Filer:	Adam Reid Stephenson/Janice Riggs			
Attorney Docket Number:	FloraTech002			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late Filing Fee for Oath or Declaration	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				70

Electronic Acknowledgement Receipt

EFS ID:	21198571
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson/Janice Riggs
Filer Authorized By:	Adam Reid Stephenson
Attorney Docket Number:	FloraTech002
Receipt Date:	13-JAN-2015
Filing Date:	19-DEC-2014
Time Stamp:	16:36:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$ 70
RAM confirmation Number	2878
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Vantage Exhibit 1002

Page 65 of 1215
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File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Sequence Listing	CoverLtrForSequenceListing.pdf	85898	no	1
			a26e0777e9a6bd22b7a9ed8f9b382c30cd89be8a		
Warnings:					
Information:					
2	Oath or Declaration filed	POA_filed.pdf	203385	no	3
			0936bb9bef6cccf3216999c57baf9f2e8863d62f		
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	IDS002_2.pdf	613930	no	6
			54751e0ff3d2b6ce373b7c3356df671e70348e64		
Warnings:					
Information:					
4	Non Patent Literature	NPL1_51.pdf	558237	no	3
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Warnings:					
Information:					
5	Non Patent Literature	NPL2_52.pdf	546652	no	3
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Warnings:					
Information:					
6	Non Patent Literature	NPL3_53.pdf	908222	no	5
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Warnings:					
Information:					
7	Non Patent Literature	NPL7_57.pdf	16457766	no	19
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Warnings:					
Information:					

8	Non Patent Literature	NPL8_58.pdf	75857	no	6
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Warnings:					
Information:					
9	Non Patent Literature	NPL9_59.pdf	115335	no	7
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Information:					
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Information:					
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Information:					
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Information:					
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Information:					
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Information:					
15	Non Patent Literature	NPL15_65.pdf	321679	no	9
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Information:					
16	Non Patent Literature	NPL16_66.pdf	92563	no	2
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Warnings:					
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Page 67 of 1215

17	Non Patent Literature	NPL17_67.pdf	128492	no	7
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Warnings:					
Information:					
18	Non Patent Literature	NPL18_68.pdf	82699	no	6
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Warnings:					
Information:					
19	Non Patent Literature	NPL19_69.pdf	369882	no	188
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Warnings:					
Information:					
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Warnings:					
Information:					
21	Sequence Listing (Text File)	SequenceListing002_ST25.txt	5895	no	0
Warnings:					
Information:					
22	Fee Worksheet (SB06)	fee-info.pdf	30203	no	2
			f6b4effe7377476ce8ef67f7f10be5a757dc46b9		
Warnings:					
Information:					
Total Files Size (in bytes):			25091909		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

AMENDMENT/REPLY

Applicant: Jeff Addy
Serial No.: 14578075
Filed: December 19, 2014
Title: Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

Docket No.: FloraTech002
Examiner: TBD
Group Art Unit: 1615

SEQUENCE LISTING STATEMENT UNDER 37 C.F.R. 1.821(G)

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madam:

The sequence listing filed herewith contains the sequence listings referenced in para. [0045] of the specification as SEQ ID NO: 1 and SEQ ID NO:2. No new matter is being introduced by the filing of this sequence listing.

Respectfully submitted,

Date: Jan 13, 2015

By: /Adam Stephenson/
Adam R. Stephenson
Reg. No. 58,349

Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste. 101
Tempe, AZ 85283
480.264.6075
480.718.8336 fax
adam@patentproblempro.com

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	TBD
Filing Date	TBD
First Named Inventor	Jeff Addy
Title	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	FloraTech002

SIGNATURE of Applicant or Patent Practitioner

Signature	/Adam R. Stephenson/	Date (Optional)	2014-01-13
Name	Adam R. Stephenson	Registration Number	58349
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐

*Total of _____ forms are submitted.

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Doc Code: PA..

Document Description: Power of Attorney

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Application Number	Filing Date
TBD	TBD

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)



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93756

OR



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The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number:

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Zip

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Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

INTERNATIONAL FLORA TECHNOLOGIES, LTD.

Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

Name

Title

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2015-01-13
	First Named Inventor	Jeff Addy	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	FloraTech002	

U.S.PATENTS							Remove	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	6123979		2000-09-26	Hepburn			
	2	8349594		2013-01-08	Pearce et al.			
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U.S.PATENT APPLICATION PUBLICATIONS							Remove	
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	20140017741		2014-01-16	Nielsen et al.			
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	WO2012130961	WO		2012-10-04	Holm et al.		☐
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2015-01-13
First Named Inventor	Jeff Addy	
Art Unit		
Examiner Name		
Attorney Docket Number	FloraTech002	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
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Signature	/Adam R. Stephenson/	Date (YYYY-MM-DD)	2014-01-13
Name/Print	Adam R. Stephenson	Registration Number	58349

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Esterification process

WO 2012130961 A1

ABSTRACT

The invention relates to the utilisation of fatty acid feedstock in the production of biodiesel by the use of microbial enzymes.

DESCRIPTION (OCR text may contain errors)

ESTERIFICATION PROCESS

REFERENCE TO A SEQUENCE LISTING

This application contains a Sequence Listing in computer readable form, which is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a novel process for the utilisation of fatty acid feedstock in the production of biodiesel.

BACKGROUND OF THE INVENTION

As a result of the increasing interest in renewable resources in general and biofuels in particular, a number of processes has been developed for the production of esters of fatty acids and lower, which esters are also referred to as 'biodiesel'. Biodiesel may be produced in a two-step enzymatic process wherein a triglyceride feedstock is reacted with a lower alcohol (e.g., methanol or ethanol) in a first lipase catalysed process step ("transesterification step") to form fatty acid methyl esters, free fatty acids and free glycerol. The fatty acid methyl esters and free fatty acids are isolated and then reacted with a lower alcohol (e.g., methanol or ethanol) in a second lipase catalysed process step ("esterification step") to form a fatty acid methyl ester composition with a very low free fatty acid content.

The specifications for biodiesel are becoming stricter with respect to for instance content of metal ions and phospholipids. To meet these specifications distillation of the biodiesel product is required. The distillation is conventionally performed as the last process step after the esterification process. However, further methods for the production of biodiesel are needed.

SUMMARY OF THE INVENTION

It has surprisingly been found that in the above two-step enzymatic biodiesel process it is advantageous to do the distillation before the esterification process step. The high purity of the feedstock from distillation secures long lifetime of the enzyme in the second lipase catalysed esterification step and facilitates the use of immobilised enzymes, e.g., in a packed bed column. In a conventional biodiesel process the use of immobilised enzymes in a packed bed column would be impractical as the column would clog up due to impurities in the feedstock.

Accordingly, the invention provides a process for the production of fatty acid alkyl esters (FAAE) from a fatty acid feedstock, comprising the steps of: (a) providing a reaction mixture 1 comprising a fatty acid feedstock, a lower alcohol and water; (b) contacting the reaction mixture 1 with a lipase; (c) allowing the reaction

Publication number	WO2012130961 A1
Publication type	Application
Application number	PCT/EP2012/055668
Publication date	Oct 4, 2012
Filing date	Mar 29, 2012
Priority date	Mar 30, 2011
Also published as	CN103459607A, EP2691532A1, US20140017741
Inventors	Hans Christian Holm, Per Munk Nielsen
Applicant	Novozymes A/S
Export Citation	BiBTeX, EndNote, RefMan
Patent Citations (16), Non-Patent Citations (10), Classifications (4), Legal Events (2)	
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CLAIMS (OCR text may contain errors)

A process for the production of fatty acid alkyl esters (FAAE) from a fatty acid feedstock, comprising the steps of:

- (a) providing a reaction mixture 1 comprising a fatty acid feedstock, a lower alcohol and water;
- (b) contacting the reaction mixture 1 with a lipase;
- (c) allowing the reaction mixture 1 to react under formation of fatty acids alkyl esters;
- (d) separation off the water/glycerol phase from the FAAE /FFA phase of reaction mixture 1 ;
- (e) distilling the FAAE /FFA phase of reaction mixture 1 to obtain distilled fatty acid feedstock comprising fatty acids alkyl esters and free fatty acids;
- (f) providing a reaction mixture 2 that comprises the distilled fatty acid feedstock and a lower alcohol;
- (g) contacting the reaction mixture 2 with a lipase; and
- (h) allowing the reaction mixture 2 to react under formation of fatty acids alkyl esters; wherein water is removed from the reaction mixture 2 during any of the steps (e), (f) and (g).

The process of claim 1 , wherein steps (e), (f) and (g) are repeated one or more times.

The process according to any of the preceding claims, wherein water is removed from reaction mixture 2 during any of the steps (f), (g) and (h) by stripping with an inert gas, by flashing, or continuous evaporation.

The process according to any of the preceding claims, wherein the amount of water during any of the steps (f), (g) and (h) are maintained below 300 ppm.

The process according to any of the preceding claims, wherein the fatty acid feedstock is derived from any of the group consisting of: algae oil, canola oil, coconut oil, castor oil, coconut oil (copra oil), corn oil, cottonseed oil, flax oil, fish oil, grape seed oil, hemp oil, jatropha oil, jojoba oil, mustard oil, canola

mixture 1 to react under formation of fatty acids alkyl esters; (d) separation off the water/glycerol phase from the FFAE/FFA phase of reaction mixture 1; (e) distilling the FFAE/FFA phase of reaction mixture 1 to obtain distilled fatty acid feedstock comprising fatty acids alkyl esters and free fatty acids; (f) providing a reaction mixture 2 that comprises the distilled fatty acid feedstock and a lower alcohol; (g) contacting the reaction mixture 2 with a lipase, and; (h) allowing the reaction mixture 2 to react under formation of fatty acids alkyl esters; wherein water is removed from the reaction mixture 2 during any of the steps (e), (f) and (g).

DETAILED DESCRIPTION OF THE INVENTION

Biodiesel

Fatty acid alkyl esters (FAAE) of short-chain alcohols, such as fatty acid methyl esters (FAME) and fatty acid ethyl esters (FAEE) are also called biodiesel, because they are used as an additive to or as replacement of fossil diesel.

It is emphasised that the fatty acid alkyl esters produced by the method of the invention is not exclusively for biodiesel, but can also be used as basic oleochemical in further down stream processes in the oleochemical industry.

Alcohol

The alcohol used in the method of the invention is preferably a short-chain, branched or linear, alcohol having 1 to 5 carbon atoms (C₁, C₂, C₃, C₄, or C₅) and mixtures thereof ("a lower alcohol"). Preferred lower alcohols are methanol, ethanol, propanol and mixtures thereof. The alcohol content is preferably less than 4, 3, 2, 1.5 or 1.0 molar equivalents to the amount of fatty acids in the reactant mixture (free and glyceride bound fatty acids). The alcohol may be added stepwise (such as in 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more steps) and/or continuously to the reaction mixture over the length of or a part of the reaction period.

Fatty acid feedstock

The term "fatty acid feedstock" is defined herein as a fatty acid feedstock substrate comprising triglyceride. The substrate may furthermore comprise fatty acid alkyl esters, diglyceride, monoglyceride, free fatty acid or any combination thereof. Any oils and fats of vegetable or animal origin comprising fatty acids may be used as substrate for producing fatty acid alkyl esters in the process of the invention.

The fatty acid feedstock may be oil selected from the group consisting of: algae oil, canola oil, coconut oil, castor oil, coconut oil (copra oil), corn oil, cottonseed oil, flax oil, fish oil, grape seed oil, hemp oil, jatropha oil, jojoba oil, mustard oil, canola oil, palm oil, palm stearin, palm olein, palm kernel oil, peanut oil, rapeseed oil, rice bran oil, safflower oil, soybean oil, sunflower oil, tall oil, and oil from halophytes, pennycress oil, camelina oil, jojoba oil, coriander seed oil, meadowfoam oil, seashore mallow oil, microbial oils or any combination thereof.

The fatty acid feedstock may be fat selected from the group consisting of: animal fat, including tallow from pigs, beef and sheep, lard, chicken fat, fish oil, yellow grease, brown grease, or any combination thereof.

The fatty acid feedstock may be crude, refined, bleached, deodorized, degummed, or any combination thereof.

Food quality oils and fats are expensive, and therefore, waste and by-products from their processing as well as non-food grade oils and fats have become increasingly attractive feedstock for fatty acid alkyl ester. Soap stock is the fraction of oil obtained in an oil refinery by treating the oil with a base to convert free fatty acids to soaps (e.g. sodium soaps). The soap stock usually contains a fraction of glycerides beside the soaps. Acid oil is the by-product from the oil refinery produced by acidification of soap stock to solubilize the soaps. It mainly contains free fatty acids (FFA) and acylglycerols. Distillates like Palm Fatty Acid Distillate (PFAD) is the by-product from oil refining coming from a distillation process used to eliminate free fatty acid from the oil.

The feedstock may be an intermediate product, a waste product or a by-product of oil or fat refining selected from the group

oil, palm oil, palm stearin, palm olein, palm kernel oil, peanut oil, rapeseed oil, rice bran oil, safflower oil, soybean oil, sunflower oil, tall oil, and oil from halophytes, pennycress oil, camelina oil, jojoba oil, coriander seed oil, meadowfoam oil, seashore mallow oil, microbial oils or any combination thereof.

6. The process according to any of the preceding claims, wherein the alcohol(s) in step (a) and/or step (f) is selected from methanol, ethanol, and propanol, including mixtures thereof.

7. The process according to any of the preceding claims, wherein the lipase in step (b) is a liquid formulated lipase and/or an immobilized lipase. 8. The process according to any of the preceding claims, wherein the lipase in step (b) is a liquid formulated lipase and the water content in the reaction mixture 1 is from 10 % to 50%.

9. The process according to any of the preceding claims, wherein step (f) is performed using an immobilized lipase.

10. The process according to any of the preceding claims, wherein the lipase is immobilized on a carrier, such as a hydrophilic carrier selected from the group containing: porous inorganic particles composed of alumina, silica or silicates such as porous glass, zeolites, diatomaceous earth, bentonite, vermiculite, hydrotalcite; and porous organic particles composed of carbohydrate polymers such as agarose or cellulose, or such as a hydrophobic carrier selected from the group containing: synthetic polymers such as nylon, polyethylene, polypropylene, polymethacrylate, or polystyrene; and activated carbon.

11. The process according to any of the preceding claims, wherein step (g) is performed in a packed bed column.

12. The process according to any of the preceding claims, wherein the lipase in step (e) and/or (f) is the *Candida antarctica* lipase B and/or an enzyme having at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, at least or even at least 99% identity to the amino acid sequence shown as SEQ ID NO: 1.

13. The process according to any of the preceding claims, wherein the lipase in step (e) and/or (f) is the *Thermomyces lanuginosus* lipase and/or an enzyme having at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, at least or even at least 99% identity to the amino acid sequence shown as SEQ ID NO: 2.

14. The process according to any of the preceding claims, wherein the water/glycerol phase from reaction mixture 1 containing the enzyme is reused in a transesterification reaction.

15. The process according to any of the preceding claims, wherein the lower alcohol applied in reaction mixture 1 is ethanol and the lower alcohol applied in reaction mixture 2 is methanol.

consisting of: soap stock; acid oil; fatty acid distillates such as PFAD, soy fatty acid distillate, rapeseed fatty acid distillate, rice bran fatty acid distillate, poultry fat fatty acid distillate, beef tallow fatty acid distillate, etc.; gums from degumming; by-products from the production of omega-3 fatty acids derivatives from fish oil; fat trap grease; yellow grease, and brown grease, free fatty acids like oleic acid; or fractions of oil obtained by physical separations; or any combinations thereof.

Enzyme immobilization

The use of immobilized enzymes in processing of oils experience significant growth due to new technology developments that have enabled cost effective methods. A fundamental advantage of immobilized enzymes is that they can be recovered and re-used from a batch process by simple filtration. Various ways of immobilizing lipases are well known in the art. A review of lipase immobilization is found in "Immobilized lipase reactors for modification of fats and oils - a review" Malcata, FX, et al. (1990) J. Am. Oil Chem. Soc. Vol.67 p.890-910, where examples of representative lipase immobilizing carriers are illustrated, including inorganic carriers such as diatomaceous earth, silica, porous glass, etc.; various synthetic resins and synthetic resin ion exchangers; and natural polysaccharide carriers such as cellulose and cross-linked dextrin introduced with ion exchange groups.

In some embodiments, the invention relates to a method, wherein the lipase is immobilized either on a carrier, by entrapment in natural or synthetic matrices, such as sol-gels, alginate, and carrageenan; by cross-linking methods such as in cross-linked enzyme crystals (CLEC) and cross-linked enzyme aggregates (CLEA); or by precipitation on salt crystals such as protein-coated micro-crystals (PCMC).

In some embodiments, the invention relates to a method, wherein the carrier is a hydrophilic carrier selected from the group containing: porous inorganic particles composed of alumina, silica or silicates such as porous glass, zeolites, diatomaceous earth, bentonite, vermiculite, hydrotalcite; and porous organic particles composed of carbohydrate polymers such as agarose or cellulose.

In some embodiments, the invention relates to a method, wherein the carrier is a hydrophobic carrier selected from the group containing: synthetic polymers such as nylon, polyethylene, polypropylene, polymethacrylate, or polystyrene; and activated carbon.

Enzyme

A suitable lipase for use in the present invention is a lipase having an enzyme activity classified within E.C. 3.1.1.3. The lipase may have additional activities, such as an activity selected from phospholipase activity, cutinase activity, and acyltransferase activity. The lipase may be a lipase selected from the *Candida antarctica* lipase A (CALA) as disclosed in WO 88/02775, the *C. antarctica* lipase B (CALB) as disclosed in WO 88/02775 and shown in SEQ ID NO: 1 herein, the *Thermomyces lanuginosus* (previously *Humicola lanuginosus*) lipase disclosed in EP 258 068, the *Thermomyces lanuginosus* variants disclosed in WO 2000/60063 or WO 1995/22615, in particular the lipase shown in positions 1-269 of SEQ ID NO: 2 of WO 95/22615, the *Hyphozyma* sp. lipase (WO 98/018912), and the *Rhizomucor miehei* lipase (SEQ ID NO:5 in WO 2004/099400), a lipase from *P. alcaligenes* or *P. pseudoalcaligenes* (EP 218 272), *P. cepacia* (EP 331 376), *P. glumae*, *P. stutzeri* (GB 1,372,034), *P. fluorescens*, *Pseudomonas* sp. strain SD 705 (WO 95/06720 and WO 96/27002), *P. wisconsinensis* (WO 96/12012); a *Bacillus* lipase, e.g., from *B. subtilis* (Dartois et al. (1993), *Biochimica et Biophysica Acta*, 1131, 253-360), *B. stearothermophilus* (JP 64/744992) or *B. pumilus* (WO 91/16422). Also preferred is a lipase from any of the following organisms: *Fusarium oxysporum*, *Absidia reflexa*, *Absidia corymbifera*, *Rhizomucor miehei*, *Rhizopus delemar* (oryzae), *Aspergillus niger*, *Aspergillus tubingensis*, *Fusarium heterosporum*, *Aspergillus oryzae*, *Penicillium camembertii*, *Aspergillus foetidus*, *Aspergillus niger*, *Aspergillus oryzae* and *Thermomyces lanuginosus*, such as a lipase selected from any of SEQ ID NOs: 1 to 15 in WO 2004/099400.

Preferably, the lipase is an enzyme having at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or even at least 99% identity to any of the aforementioned lipases.

More preferred, the lipase has at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, at least or even at least 99% identity to the amino acid sequence shown as positions 1-342 of SEQ ID NO: 1 herein.

Immobilized lipases suitable for use in the process of the invention and examples of commercially available immobilized lipase include the ones sold under the trade names Novozym 435, Lipozyme RM IM or Lipozyme TL IM, Lipozyme TL 100L, Lipozyme TL HC from Novozymes A/S, Bagsvaerd, Denmark, or Amano PS, from Amano, Japan.

Typically, the enzyme is used in a concentration corresponding to 1 LU/g fatty acid feedstock to 1000 LU/g fatty acid feedstock. Preferably the enzyme is used in a concentration of between 5 LU/g fatty acid feedstock to 500 LU/g fatty acid feedstock, more preferably between 10 LU/g fatty acid feedstock to 100 LU/g fatty acid feedstock.

Typically, the enzyme is used in a concentration corresponding to 1 PLU/g fatty acid feedstock to 1000 PLU/g fatty acid feedstock. Preferably the enzyme is used in a concentration of between 5 PLU/g fatty acid feedstock to 500 PLU/g fatty acid feedstock, more preferably between 10 PLU/g fatty acid feedstock to 100 PLU/g fatty acid feedstock.

Enzyme sources

The lipase used in the process of the invention may be derived or obtainable from any of the sources mentioned herein. The term "derived" means in this context that the enzyme may have been isolated from an organism where it is present natively, i.e. the identity of the amino acid sequence of the enzyme are identical to a native enzyme. The term "derived" also means that the enzymes may have been produced recombinantly in a host organism, the recombinant produced enzyme having either an identity identical to a native enzyme or having a modified amino acid sequence, e.g. having one or more amino acids which are deleted, inserted and/or substituted, i.e. a recombinantly produced enzyme which is a mutant and/or a fragment of a native amino acid sequence. Within the meaning of a native enzyme are included natural variants. Furthermore, the term "derived" includes enzymes produced synthetically by e.g. peptide synthesis. The term "derived" also encompasses enzymes which have been modified e.g. by glycosylation, phosphorylation etc., whether in vivo or in vitro. The term "obtainable" in this context means that the enzyme has an amino acid sequence identical to a native enzyme. The term encompasses an enzyme that has been isolated from an organism where it is present natively, or one in which it has been expressed recombinantly in the same type of organism or another, or enzymes produced synthetically by e.g. peptide synthesis. With respect to recombinantly produced enzyme the terms "obtainable" and "derived" refers to the identity of the enzyme and not the identity of the host organism in which it is produced recombinantly.

Accordingly, the lipase may be obtained from a microorganism by use of any suitable technique. For instance, an enzyme preparation may be obtained by fermentation of a suitable microorganism and subsequent isolation of an enzyme preparation from the resulting fermented broth or microorganism by methods known in the art. The enzyme may also be obtained by use of recombinant DNA techniques. Such method normally comprises cultivation of a host cell transformed with a recombinant DNA vector comprising a DNA sequence encoding the enzyme in question and the DNA sequence being operationally linked with an appropriate expression signal such that it is capable of expressing the enzyme in a culture medium under conditions permitting the expression of the enzyme and recovering the enzyme from the culture. The DNA sequence may also be incorporated into the genome of the host cell. The DNA sequence may be of genomic, cDNA or synthetic origin or any combinations of these, and may be isolated or synthesized in accordance with methods known in the art.

The optimum parameters for enzymatic activity will vary depending upon the enzyme used. The rate of enzyme degradation depends upon factors known in the art, including the enzyme concentration, substrate concentration, temperature, the presence or absence of inhibitors and presence of water. These parameters may be adjusted to optimise the esterification reaction.

During an enzymatic treatment step, the temperature of the suspension should be adjusted to provide effective enzyme activity. In general, a temperature of about 30°C to about 90°C is used, particularly from about 35°C to about 60°C.

Process design

In the present process for enzymatic production of biodiesel a reaction mixture 1 comprising a triglyceride feedstock, a lower alcohol (e.g., methanol or ethanol) and water in a first lipase catalysed transesterification process step forms fatty acid alkyl esters, free fatty acids and free glycerol. Furthermore, glycerol may be added to the reaction mixture 1.

The lipase applied in the first lipase catalysed process step (transesterification step) may be an immobilized lipase on a carrier; the immobilized lipase may be held in suspension in the reaction mixture by agitation. With an immobilized lipase the water content is preferably around 0.5%.

The lipase applied in the first lipase catalysed process step may also be a non-immobilized lipase, i.e., a liquid formulated lipase. In that case the first lipase catalysed process step is preferably performed having a water content in the reaction mixture 1 of from 10% to 50%, from 15% to 40%, or even from 20% to 30%; following the first lipase catalysed process step the reaction mixture 1 the water/glycerol phase containing the non-immobilized lipase is separated from the reaction mixture 1 and may be recycled to new batches of triglyceride feedstock. The oil phase of the reaction mixture 1 is isolated by distillation to yield a very pure fatty acid alkyl ester and free fatty acid fraction having a water content of no more than 500 ppm of water, 300 ppm of water, or even 200 ppm of water. The term distillation is intended to include any type of distillation process such as steam distillation, vacuum stripping and deodorization (Lipid Handbook s 245. 3ed ed. Gunstone et al. CRC Press 2007). A reaction mixture 2 is formed by the fatty acid alkyl ester and free fatty acid fraction and a lower alcohol (e.g., methanol or ethanol). In the second lipase catalysed process step (esterification step) the remaining free fatty acids react with the lower alcohol and a fatty acid alkyl ester fraction with very low FFA content is formed. The second lipase catalysed process step is preferably performed using immobilised enzymes, e.g., by passing reaction mixture 2 through the immobilised enzymes in a packed bed column. Water is a reaction product and needs to be removed from the reaction mixture 2 throughout the reaction period to drive the process to the ester-side - either in a number of steps (e.g. by vacuum treatment as in Example 1) or continuously (e.g. by stripping with an inert gas flow such as in US2010/167360). The final product after the second lipase catalysed process step is a very pure fatty acid alkyl ester fraction having less than 0.25% FFA, less than 0.20% FFA, less than 0.15% FFA or even less than 0.10% FFA and/or less than 300 ppm water, less than 200 ppm water, less than 100 ppm water, or even less than 50 ppm water. The lower alcohol applied in the first lipase catalysed process step for transesterification of the triglyceride may be any lower alcohol, preferably methanol, ethanol

and/or propanol.

The lower alcohol applied in the second lipase catalysed process step for esterification of the FFA may be any lower alcohol, preferably methanol, ethanol and/or propanol. Different lower alcohols may be applied in the first and the second lipase catalysed process steps (i.e. in the reaction mixtures 1 and 2). In a preferred embodiment ethanol is applied in the first lipase catalysed process step and methanol is applied in the second lipase catalysed process step.

MATERIALS AND METHODS

Degree of identity

For purposes of the present invention, the degree of identity may be suitably determined according to the method described in Needleman, S. B. and Wunsch, CD., (1970), Journal of Molecular Biology, 48, 443-45, with the following settings for polypeptide sequence comparison: GAP creation penalty of 3.0 and GAP extension penalty of 0.1. The determination may be done by means of a computer program known such as GAP provided in the GCG program package (Program Manual for the Wisconsin Package, Version 8, August 1994, Genetics Computer Group, 575 Science Drive, Madison, Wisconsin, USA 53711).

Two given sequences can be aligned according to the method described in Needleman and Wunsch (supra) using the same parameters. This may be done by means of the GAP program (supra).

Lipolytic Activity

The lipolytic activity may be determined using tributyrin as substrate. This method is based on the hydrolysis of tributyrin by the enzyme, and the alkali consumption to keep pH constant during hydrolysis is registered as a function of time. One Lipase Unit (LU) is defined as the amount of enzyme which, under standard conditions (i.e. at 30°C; pH 7.0; with 0.1 % w/v Gum Arabic as emulsifier and 0.16 M tributyrin as substrate) liberates 1 micromol titrable butyric acid per minute. One KLU is 1000 LU.

The ester synthesis activity of immobilised lipases may be determined as Propyl Laurate Units per gram product: PLU/g. The immobilised lipase esterify lauric acid with 1-propanol, forming propyl laurate. The activity $\mu\text{mol/g/min}$ is determined by quantification of formed propyl laurate and consumed lauric acid by GC.

One PLU unit is defined as the amount of enzyme which, under standard conditions (i.e. at 60°C and reaction time 20 min.) forms 1 micromole propyl laurate per minute.

Enzymes

Novozym 435 is a commercial enzyme product from Novozymes A/S comprising an immobilized lipase B from *Candida antarctica* (SEQ ID NO: 1 herein). The product has an activity of 10000 PLU/g.

Lipex 100L is a commercial enzyme product from Novozymes A/S comprising an immobilized lipase from *Thermomyces lanuginosus* (SEQ ID NO: 2 herein). The product has an activity of 100 KLU/g.

Lipozyme TL 100L is a commercial enzyme product from Novozymes A/S comprising a liquid formulated lipase from *Thermomyces lanuginosus* (SEQ ID NO: 2 herein). The product has an activity of 100 KLU/g. Example 1 A process of the invention may comprise:

1. transesterification with
 - a. liquid formulated lipase, or
 - b. immobilized lipase,
2. separation of the FAME/FFA ester phase from water/glycerol phase,
3. distillation off of the FAME and FFA from the FAME/FFA phase, and
4. esterification of the FFA in the distillate.

1 a.

Soybean oil is mixed with water and glycerol in the ratio 80: 10: 10 w/w and adjusted to 40°C. Liquid formulated enzyme (Lipozyme TL 100L, Novozymes Denmark) is added at dosage 0.5% of the oil. The reaction mixture is incubated with stirring at 40°C for 22 hours. Methanol is added in an amount of 1.3 molar equivalents relative to the fatty acids in the oil (14.1 g methanol to 100 g oil). The methanol is added gradually over the first 5 hours of incubation. When the reaction is finalized the content of FAME and FFA in the FAME/FFA phase is expected to be approximately 92% and 6%, respectively.

1 b.

Soybean oil is mixed with water and glycerol in the ratio 80: 10: 10 w/w and adjusted to 40°C. Immobilized enzyme (Lipozyme TL HC, Novozymes Denmark) is added at dosage 5% of the oil. The reaction mixture is incubated with stirring at 40°C for 22 hours. Methanol is added in an amount of 1.3 molar equivalents relative to the fatty acids in the oil (14.1 g methanol to 100 g oil). The methanol is added gradually over the first 5 hours of incubation. When the reaction is finalized, the expected content of FAME and FFA in the FAME/FFA phase is expected to be approximately 92% and 6%, respectively.

2.

The FAME/FFA phase is obtained by decanting off the water/glycerol phase. When liquid enzyme is used the water/glycerol phase contains the enzyme and can be re-used for further batches of FAME production.

3.

The FAME/FFA phase is distilled to obtain distilled fatty acid feedstock expected to be composed of 6% oleic acid and 94% FAME.

4. The distilled fatty acid feedstock is (a) dried by vacuum treatment at 50°C to a water content of < 200 ppm, (b) four % methanol is added and (c) this reaction mixture is pumped through a packed bed column with immobilized lipase (Novozym 435, Novozymes Denmark) held at 40°C. This treatment (a, b and c) is performed three times and the final reaction product is vacuum dried to a water content < 200 ppm. By the three passes through the column the FFA content is expected to be reduced to < 0.25% and the product is ready for use as biodiesel. The wet methanol collected from the vacuum drying of the reaction mixture can be re-used in the transesterification in step 1 (a or b) as this reaction is tolerant to water.

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CLASSIFICATIONS

International Classification C12P7/64

Cooperative Classification Y02E50/13, C12P7/649

European Classification C12P7/64

LEGAL EVENTS

Date	Code	Event	Description
Oct 1, 2013	WWE		Country of ref document: US Ref document number: 14004609
Nov 21, 2012	121		Kind code of ref document: A1 Ref document number: 12717625 Country of ref document: EP

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EFS ID:	21199797
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson/Janice Riggs
Filer Authorized By:	Adam Reid Stephenson
Attorney Docket Number:	FloraTech002
Receipt Date:	13-JAN-2015
Filing Date:	19-DEC-2014
Time Stamp:	17:39:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Vantage Exhibit 1002

Page 94 of 1215

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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3181042

SUBMISSION TYPE:	NEW ASSIGNMENT								
NATURE OF CONVEYANCE:	ASSIGNMENT								
CONVEYING PARTY DATA									
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JEFF ADDY	12/19/2014								
CLAY DALY	12/19/2014								
JAMES H. BROWN	12/20/2014								
RECEIVING PARTY DATA									
Name:	INTERNATIONAL FLORA TECHNOLOGIES, LTD.								
Street Address:	291 E. EL PRADO COURT								
City:	CHANDLER								
State/Country:	ARIZONA								
Postal Code:	85225								
PROPERTY NUMBERS Total: 1									
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Application Number:	14578075								
CORRESPONDENCE DATA									
Fax Number:	(480)718-8336								
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>									
Phone:	480-264-6075								
Email:	adam@patentproblempro.com								
Correspondent Name:	ADAM R. STEPHENSON, LTD.								
Address Line 1:	40 W. BASELINE RD., STE 101								
Address Line 4:	TEMPE, ARIZONA 85283								
ATTORNEY DOCKET NUMBER:	FLORATECH002								
NAME OF SUBMITTER:	ADAM R. STEPHENSON								
SIGNATURE:	/Adam R. Stephenson/								
DATE SIGNED:	01/13/2015								
This document serves as an Oath/Declaration (37 CFR 1.63).									
Total Attachments: 6									
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Vantage Exhibit 1002

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PATENT ASSIGNMENT

This Assignment is made and executed by Jeff Addy, an Arizona resident having an address of 291 E. El Prado Court, Chandler, AZ 85225, Clay Daly, an Arizona resident having an address of 291 E. El Prado Court, Chandler, AZ 85225, and James H. Brown, an Arizona resident having an address of 291 E. El Prado Court, Chandler, AZ 85225 (hereinafter each referred to individually as an "Assignor" and referred to collectively as "Assignors") to and in favor of International Flora Technologies, Ltd. (hereinafter "Assignee"), an Arizona corporation having an address of 291 E. El Prado Court, Chandler, AZ 85225.

Whereas Assignee desires to acquire each Assignor's entire right, title and interest in and to the invention(s) and the subject matter described in the United States nonprovisional utility patent application entitled "Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives", filed on December 19, 2014 and assigned serial number 14578075, (hereinafter the "Patent Application") for the territory of the United States of America (hereinafter "U.S.") and all foreign countries; and whereas each Assignor desires to assign his/her entire right, title and interest in and to the invention(s) and the subject matter described in the Patent Application for the territory of the U.S. and all foreign countries to Assignee for good and valuable consideration, and whereas Assignee has provided such good and valuable consideration to each Assignor, the receipt and sufficiency of which each Assignor hereby acknowledges; accordingly, each Assignor hereby warrants, covenants, and agrees as follows:

1. Each Assignor hereby sells, assigns, conveys, transfers, and sets over to Assignee, its successors, legal representatives and assigns his/her entire right, title and interest in and to: (a) the Patent Application itself; (b) every U.S. patent that has issued or that issues and that is based in whole or in part on the Patent Application or the subject matter thereof, including every non-provisional, divisional, continuation, continuation-in-part, reissue, reexamination, substitution, extension, counterpart and the like; (c) every U.S. patent application, already filed or to be filed, that is based in whole or in part on the Patent Application or the subject matter thereof, including every counterpart, divisional, continuation, continuation-in-part, provisional, non-provisional, reissue, reexamination, extension, substitution and the like; (d) every non-U.S. patent, inventor's certificate, utility model, design and every like property or right that has issued or that issues and that is based in whole or in part on the Patent Application or the subject matter thereof, including every provisional, non-provisional, divisional, continuation, continuation-in-part, substitution and the like; (e) every non-U.S. application for a patent, inventor's certificate, utility model, design or like property or right, filed or to be filed, that is based in whole or in part on the Patent Application or the subject matter thereof, including every divisional, continuation, continuation-in-part, non-provisional, provisional, substitution and the like, and; (f) all priority rights, Convention rights and like benefits in the U.S. and every foreign country related to the Patent Application, the subject matter thereof, or any application or issued or granted property or right described in this section 1, including but not limited to any and all rights under the Paris Convention, the Patent Cooperation Treaty and any other international agreements to which the U.S. adheres.

2. Each Assignor agrees that Assignee may apply for patents, utility models, designs, inventor's certificates and the like, in the U.S. and in all foreign countries, based in whole or in part on the invention(s) or the subject matter described in the Patent Application or any other application or issued or granted property or right described in section 1 above. Each Assignor hereby grants to Assignee the sole and exclusive right to prosecute the Patent Application and every application described in section 1 above as well as any and all opposition proceedings, reissue applications, reexaminations, supplemental examinations, nullity proceedings, invalidity proceedings, pre-grant opposition proceedings, and the like. Each Assignor authorizes all U.S. and foreign governmental bodies, including the U.S. Patent and Trademark Office (hereinafter "USPTO"), having the power and/or authority to issue patents, inventor's certificates, designs, utility models, or the like based in whole or in part on the Patent Application or the subject matter thereof, or any application or issued or granted property or right described in section 1 above, to issue such in the name of Assignee or, as the case may be, Assignee's successors, legal representatives or assigns.

3. Each Assignor grants to Assignee, its successors, legal representatives, and assigns, the right to sue third parties for present and past damages related to the invention(s) and the subject matter described in the Patent Application.

4. Each Assignor warrants and covenants that he/she has the full and unencumbered right to sell, assign, convey, transfer and set over the interests hereby sold, assigned, conveyed, transferred and set over, and that he/she has not executed and will not execute any document or instrument in conflict with this Assignment.

5. Each Assignor further covenants and agrees that, upon request and without further consideration, but at the expense of Assignee, he/she will: (a) assist Assignee in prosecuting the Patent Application and each application described in section 1 above as well as opposition proceedings, reissue applications, reexaminations, supplemental examinations, nullity proceedings, invalidity proceedings, pre-grant opposition proceedings and the like; (b) provide Assignee with information concerning the invention(s) and the subject matter described in the Patent Application and each application and issued or granted property or right described in section 1 above; (c) execute, sign and deliver papers, make all rightful oaths and testify in any legal proceedings related to the Patent Application or any application or issued or granted property or right described in section 1 above; (d) execute additional assignment documents in favor of Assignee, similar to this Assignment, for each application and each issued or granted property or right described in section 1 above, and; (e) perform all other reasonably necessary acts; to enable Assignee to obtain, secure, maintain, protect and enforce all of the rights, title and interest sold, assigned, conveyed, transferred and set over under this Assignment and to file and issue the Patent Application and each application and issued or granted property or right described in section 1 above in the name of Assignee as applicant and owner.

6. Assignee may assign any right, title and interest sold, assigned, conveyed, transferred and set over under this Assignment, in whole or in part, to any party.

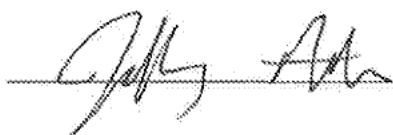
7. All references herein to Assignee include any successors, legal representatives or assigns of Assignee.

8. The above-identified Patent Application was made or authorized to be made by each Assignor. Each Assignor believes that he/she is the original inventor or an original joint inventor of a claimed invention in the Patent Application. Each Assignor acknowledges that any willful false statement made in this paragraph is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

9. Each Assignor hereby authorizes and requests any attorney of the law firm of Adam R. Stephenson, LTD., Customer number 93756, to insert, after execution of this Assignment, the above filing date and application number of the Patent Application and any further information necessary or desirable for purposes of recording this Assignment with the USPTO.

Executed this 19 day of December, 20 14 at Chandler, Arizona by:
(City and State)

Legal Name: Jeff Addy
Print or Type

Signature: 

Mailing Address: 291 E. El Prado Ct.
Chandler, AZ, 85225

Residence: X Same as mailing address, or:

Executed this 19th day of December, 20 14 at Chandler, Arizona by:
(City and State)

Legal Name: Clay L. Daly
Print or Type

Signature: Clay L. Daly

Mailing Address: 291 E. El Prado Court
Chandler, Arizona 85225

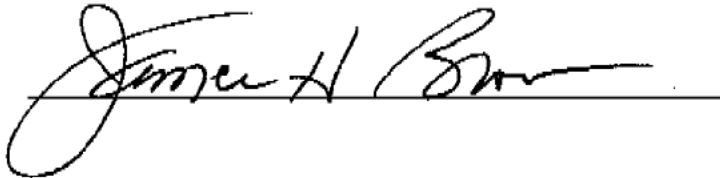
Residence: X Same as mailing address, or:

FloraTech002

Executed this 20th day of Dec, 2014 at Ellicott City, Md by:
(City and State)

Legal Name: James H. Brown
Print or Type

Signature:



Mailing Address: 291 E. EL PRADO CT
Chandler, AZ 85225

Residence: ☒ Same as mailing address, or:

=====

Sequence Listing was accepted.

If you need help call the Patent Electronic Business Center at (866)
217-9197 (toll free).

Reviewer: Anjum, Durreshwar (CGI Federal)

Timestamp: [year=2015; month=1; day=14; hr=7; min=12; sec=7; ms=554;]

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
14/578,075	12/19/2014	1615	800	FloraTech002	20	3

CONFIRMATION NO. 2053

UPDATED FILING RECEIPT



93756
Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

Date Mailed: 01/22/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Jeff Addy, Chandler, AZ;
Clay Daly, Chandler, AZ;
James H. Brown, Chandler, AZ;

Applicant(s)

International Flora Technologies, Ltd., Chandler, AZ

Power of Attorney: The patent practitioners associated with Customer Number 93756

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 01/08/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/578,075**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

**** SMALL ENTITY ****

Title

Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

Preliminary Class

424

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/578,075	12/19/2014	Jeff Addy	FloraTech002

93756
Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

CONFIRMATION NO. 2053
POA ACCEPTANCE LETTER



Date Mailed: 01/22/2015

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/13/2015.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/lvongxay/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/578,075				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 40 =	0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
			TOTAL	730		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
14/578,075	12/19/2014	1615	800	FloraTech002	20	3

CONFIRMATION NO. 2053

UPDATED FILING RECEIPT



93756
Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

Date Mailed: 01/22/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Jeff Addy, Chandler, AZ;
Clay Daly, Chandler, AZ;
James H. Brown, Chandler, AZ;

Applicant(s)

International Flora Technologies, Ltd., Chandler, AZ

Power of Attorney: The patent practitioners associated with Customer Number 93756

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 01/08/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/578,075**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

**** SMALL ENTITY ****

Title

Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

Preliminary Class

424

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/578,075	12/19/2014	Jeff Addy	FloraTech002

93756
Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

CONFIRMATION NO. 2053
POA ACCEPTANCE LETTER



Date Mailed: 01/22/2015

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/13/2015.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/lvongxay/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/578,075			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A			
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 40 =	0.00	OR				
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00					
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00					
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00					
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL			
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =		
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =		
	Application Size Fee (37 CFR 1.16(s))					OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR			
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE			
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =		
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =		
	Application Size Fee (37 CFR 1.16(s))					OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR			
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									

Electronic Acknowledgement Receipt

EFS ID:	23597549
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson/Janice Riggs
Filer Authorized By:	Adam Reid Stephenson
Attorney Docket Number:	FloraTech002
Receipt Date:	24-SEP-2015
Filing Date:	19-DEC-2014
Time Stamp:	17:51:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	NPL18.pdf	104285 e9761f67ee0f8f5a5c0d3830d088c879e4e8c117	no	5

Warnings:

Information:

Vantage Exhibit I002

Page 120 of 1215

CARGILL 00000145

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

RESCISSION OF PREVIOUS NONPUBLICATION REQUEST (35 U.S.C. 122(b)(2)(B)(ii)) AND, IF APPLICABLE, NOTICE OF FOREIGN FILING (35 U.S.C. 122(b)(2)(B)(iii))	Application Number	14578075
	Filing Date	2014-12-19
	First Named Inventor	Jeff Addy
	Title	Processes and Systems for Catalytic Manufact
	Atty Docket Number	FLORATECH002
	Art Unit	1657
	Examiner	SRIVASTAVA, KAILASH C

Send completed form to:
Mail Stop PG Pub
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450
 FAX: (571) 273-8300

A request that the above-identified application not be published under 35 U.S.C. 122(b) (nonpublication request) was included with the above-identified application on filing pursuant to 35 U.S.C. 122(b)(2)(B)(i).
 I hereby **rescind** the previous nonpublication request.

If a notice of foreign or international filing is or will be required by 35 U.S.C. 122(b)(2)(B)(iii) and 37 CFR 1.213(c), I hereby provide such notice. This notice is being provided no later than forty-five (45) days after the date of such foreign or international filing.

If a notice of subsequent foreign or international filing required by 35 U.S.C. 122(b)(2)(B)(iii) and 37 CFR 1.213(c) was not filed within forty-five (45) days after the date of filing of the foreign or international application, the application is ABANDONED, and a petition to revive under 37 CFR 1.137(b) is required. See 37 CFR 1.137(f).

/Adam Stephenson/

1/18/2016

Signature

Date

Adam R. Stephenson

58349

Typed or printed name

Registration Number, if applicable

480.264.6075

Telephone Number

This request must be signed in compliance with 37 CFR 1.33(b).

If information or assistance is needed in completing this form, please contact the Pre-Grant Publication Division at (703)605-4283 or by e-mail at PGPub@USPTO.gov.

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop PG Pub, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature /Adam Stephenson/

Name (Print/Type) Adam R. Stephenson

Date

1/18/2016

This collection of information is required by 37 CFR 1.213(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop PG Pub, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Vantage Exhibit 1002

Page 122 of 1215

CARGILL 00000147

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	24650417
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	
Filer Authorized By:	
Attorney Docket Number:	FloraTech002
Receipt Date:	18-JAN-2016
Filing Date:	19-DEC-2014
Time Stamp:	20:30:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Rescind Nonpublication Request for Pre Grant Pub	RescindNonPublication002.pdf	260991 5a7f009eb8ccce8bbcb604b7f27be7620d2ebfea	no	2

Warnings:

Information:

Vantage Exhibit 1002

Page 124 of 1215

CARGILL 00000149

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/578,075	12/19/2014	Jeff Addy	FloraTech002

93756
Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

CONFIRMATION NO. 2053
NONPUBLICATION RESCISSION
LETTER



Date Mailed: 01/22/2016

**Communication Regarding Rescission Of
Nonpublication Request and/or Notice of Foreign Filing**

Applicant's rescission of the previously-filed nonpublication request and/or notice of foreign filing is acknowledged. The paper has been reflected in the Patent and Trademark Office's (USPTO's) computer records so that the earliest possible projected publication date can be assigned.

The projected publication date is 06/23/2016.

If applicant rescinded the nonpublication request before or on the date of "foreign filing,"¹ then no notice of foreign filing is required.

If applicant foreign filed the application after filing the above application and before filing the rescission, and the rescission did not also include a notice of foreign filing, then a notice of foreign filing (not merely a rescission) is required to be filed within 45 days of the date of foreign filing. See 35 U.S.C. § 122(b)(2)(B)(iii), and Clarification of the United States Patent and Trademark Office's Interpretation of the Provisions of 35 U.S.C. § 122(b)(2)(B)(ii)-(iv), 1272 Off. Gaz. Pat. Office 22 (July 1, 2003).

If a notice of foreign filing is required and is not filed within 45 days of the date of foreign filing, then the application becomes abandoned pursuant to 35 U.S.C. § 122(b)(2)(B)(iii). In this situation, applicant should either file a petition to revive or notify the Office that the application is abandoned. See 37 CFR 1.137(f). Any such petition to revive will be forwarded to the Office of Petitions for a decision. Note that the filing of the petition will not operate to stay any period of reply that may be running against the application.

Questions regarding petitions to revive should be directed to the Office of Petitions at (571) 272-3282.

¹ Note, for purpose of this notice, that "foreign filing" means "filing an application directed to the same invention in another country, or under a multilateral international agreement, that requires publication of applications 18 months after filing".

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/mmasfaw/

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ALEXANDRIA VA 22313-1451

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Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283



**Courtesy Reminder for
Application Serial No: 14/578,075**

Attorney Docket No: FloraTech002

Customer Number: 93756

Date of Electronic Notification: 01/22/2016

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Vantage Exhibit 1002

Page 127 of 1215

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14578075
	Filing Date	2014-12-19
	First Named Inventor	Jeff Addy
	Art Unit	
	Examiner Name	
	Attorney Docket Number	Floritech002

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	2	20130185991		2013-07-25	Nishiama et al.	
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	14578075
Filing Date	2014-12-19
First Named Inventor	Jeff Addy
Art Unit	
Examiner Name	
Attorney Docket Number	Floritech002

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
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Application Number	14578075
Filing Date	2014-12-19
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Art Unit	
Examiner Name	
Attorney Docket Number	Floritech002

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Adam Stephenson/	Date (YYYY-MM-DD)	2016-05-23
Name/Print	Adam R. Stephenson	Registration Number	58349

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(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 October 2001 (04.10.2001)

PCT

(10) International Publication Number
WO 01/72683 A1

(51) International Patent Classification⁷: **C07C 69/76**,
A61K 7/44

(21) International Application Number: PCT/US01/09962

(22) International Filing Date: 28 March 2001 (28.03.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/535,826 28 March 2000 (28.03.2000) US

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- with amended claims

Date of publication of the amended claims: 29 November 2001

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WO 01/72683 A1

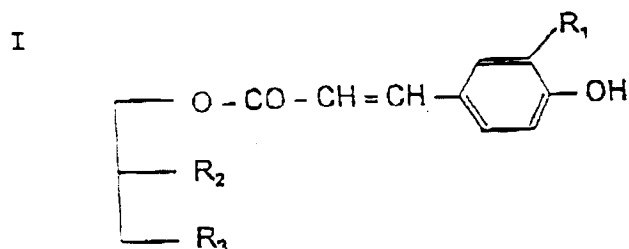
(54) Title: NOVEL SUNSCREENS FROM VEGETABLE OIL AND PLANT PHENOLS

(57) Abstract: Lipase-catalyzed transesterification reactions yield novel ferulyl-substituted or coumaryl-substituted acylglycerols with properties suitable for use as sunscreen agents having broad spectrum UV protection. These agents have the advantage of being synthesized from natural materials, while providing a value-added use for vegetable oils. They are readily incorporated into standard sunscreen formulations.

AMENDED CLAIMS

[received by the International Bureau on 26 September 2001 (26.09.01);
original claims 1-22 amended (4 pages)]

1. A compound having the structural formula:



wherein $\text{R}_1 = \text{H}$ or OCH_3 ; and

wherein one of R_2 or R_3 is a C2-C24 fatty acid moiety and the other of R_2 or R_3 is either a C2-C24 fatty acid moiety or OH.

2. The compound of Claim 1, wherein R_1 is OCH_3 .

3. The compound of Claim 1, wherein one of R_2 or R_3 is OH.

4. The compound of Claim 1, wherein both R_2 and R_3 are C2-C24 fatty acid moieties.

5. The compound of Claim 1, wherein R_1 is OCH_3 and wherein one of R_2 or R_3 is a C18 fatty acid moiety and the other of R_2 or R_3 is OH.

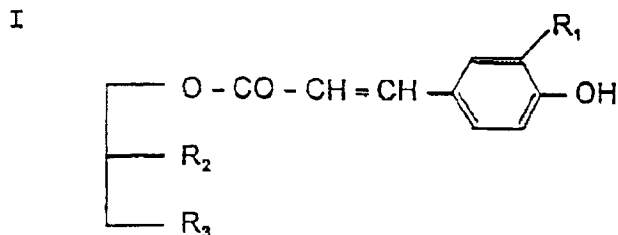
6. The compound of Claim 5, wherein the C18 fatty acid moiety is a monoene.

7. The compound of Claim 1, wherein R_1 is OCH_3 and wherein both R_2 and R_3 are C18 fatty acid moieties.

8. The compound of Claim 7, wherein at least one of the C18 fatty acid moieties is a monoene.

9. A sunscreen formulation comprising:

(1) a sunscreen agent having the structural formula:



wherein $\text{R}_1 = \text{H}$ or OCH_3 ; and

wherein one of R_2 or R_3 is a C2-C24 fatty acid moiety and other other of R_2 or R_3 is either a C2-C24 fatty acid moiety or OH; and

(2) a carrier for the sunscreen agent;

wherein said agent is present in said formulation at a level in the range of about 0.1 to 20% by weight.

10. The formulation of Claim 9, wherein said agent is present in the range of about 1-10% by weight.

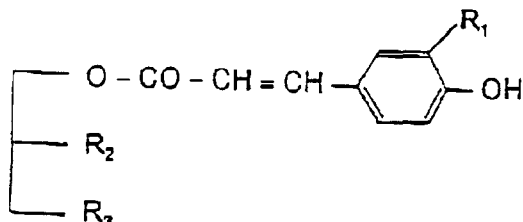
11. The formulation of Claim 9, wherein said wherein R_1 is OCH_3 .

12. The formulation of Claim 9, wherein R_1 is OCH_3 , and wherein at least one of R_2 and R_3 is a C16 or C18 fatty acid moiety.

13. The compound of Claim 12, wherein said C16 or C18 fatty acid moiety is an unsaturated.

14. A method of making a compound having the structural formula:

I



wherein $\text{R}_1 = \text{H}$ or OCH_3 ; and

wherein one of R_2 or R_3 is a C2-C24 fatty acid moiety and the other of R_2 or R_3 is either a C2-C24 fatty acid moiety or OH;

comprising the steps:

- a. reacting in a reaction mixture an ester of ferulic or coumaric acid with a triglyceride in the presence of a lipase catalyst under conditions that permit transesterification of said ester and said triglyceride; and
- b. recovering said compound from said reaction mixture.

15. The method of Claim 14, wherein said reaction mixture comprises a solvent other than said triglyceride.

16. The method of Claim 14, wherein said reaction mixture does not comprise a solvent other than said triglyceride.

17. The method of Claim 14, wherein said ester is ethyl ferulate.

18. The method of Claim 14, wherein said triglyceride is a vegetable oil.

19. The method of Claim 14, wherein said triglyceride is a vegetable oil selected from the group consisting of soybean oil, corn oil, sunflower seed oil, high-oleic sunflower seed

oil, canola oil, safflower oil, cuphea oil, jojoba oil, coconut oil, and palm kernel oil.

20. A product produced by the process of Claim 14.

21. A product produced by the process of Claim 17.

22. A product produced by the process of Claim 18.

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
7 July 2005 (07.07.2005)

PCT

(10) International Publication Number
WO 2005/061686 A1

(51) International Patent Classification⁷: **C11D 3/37**,
B01F 17/34, A61K 7/06

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(21) International Application Number:
PCT/US2003/037112

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(22) International Filing Date:
20 November 2003 (20.11.2003)

(25) Filing Language: English

(81) Designated States (*national*): CA, JP, US.

(26) Publication Language: English

(84) Designated States (*regional*): European patent (AT, BE,
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,
IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

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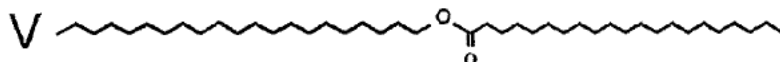
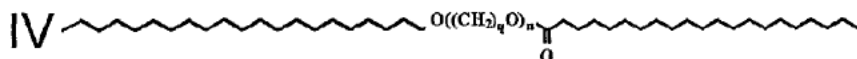
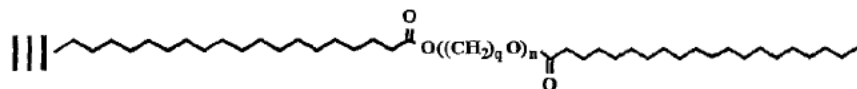
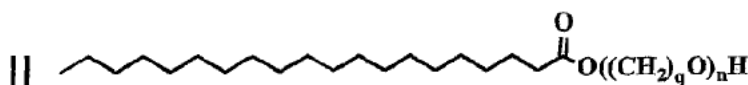
Published:
— with international search report

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*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(75) Inventors/Applicants (*for US only*): **BROWN, James, H.**

(54) Title: ALKOXYLATED FATTY ESTER COMPOSITIONS



(57) Abstract: Described is an alkoxyated composition that comprises a family of compositions that generally have melting points that range from 30-80 °C, preferably with melting points between 55-58°C and with a solubility profile compatible with a broad range of cosmetic and industrial chemical bases. At room temperature (-P20 °C), this family of compositions varies from pourable liquids, to soft creams, to pasty waxes, to a brittle hard material. These compounds, whether used pure or when combined with other carrier and vehicle components (including other additives, thickeners or binders) can form excellent carrier and vehicles for delivery of compositions for use in the cosmetic, personal care and/or pharmaceutical field, including the cosmeceutical field where cosmetic compositions also provide pharmaceutical or other therapeutic benefits.

WO 2005/061686 A1

Alkoxylated Fatty Ester Compositions

FIELD OF THE INVENTION

The present invention relates to novel alkoxylated fatty esters, their uses, and methods of manufacture thereof. More specifically, the present invention is related to ethoxylated
5 monoesters, propoxylated monoesters and ethoxylated/propoxylated esters, wherein the esters are derived from natural products, such as plant and animal oils and waxes.

BACKGROUND

Natural products and their derivatives are increasingly favored in the cosmetics industry since consumers have become more environmentally sensitive. Further, consumers
10 have recognized the value of many unique properties displayed by natural products and their derivatives.

One common method of producing natural products for the cosmetic industry is to extract an oil or wax from the seed of a plant. Oils and waxes are a group of organic substances that form an important and useful part of the cosmetic and other industries.
15 Generally, waxes are solid and oils are liquid at ordinary room temperatures. However, some tropical products, which are liquids in their sites of origin, become solids in cooler climates, often retain the name originally given, e.g., palm oil and coconut oil. Waxes and oils are derived from both plant and animal sources.

Chemically most fats and oils are either simple or mixed glyceryl esters of organic
20 acids belonging to the fatty-acid series (triglycerides). Triglycerides are esters formed from glycerol and three fatty acids that may be identical or different from each other. In a simple triglyceride such as tripalmitin or tristearin, all three fatty-acid groups are identical. In a mixed triglyceride, two or even three different fatty-acid groups are present. Most oils and waxes contain mixed triglycerides.

Waxes are often found as trace components of triglyceride oils or can be extracted in a more pure form from certain botanical and animal sources. Sunflower and corn oils contain natural waxes, while jojoba, carnauba and candelilla are examples of waxes found naturally in a more pure form. Beeswax and lanolin are examples of natural waxes of insect and animal origin. These example waxes range from the liquid, unsaturated jojoba oil to the almost completely saturated sunflower wax.

In order to control, or modify, various properties, such as solubility or melting point, of oils and waxes, certain modifications can be introduced into the triglyceride and/or wax ester structure. One such modification is the introduction of ethylene oxide (ETO) and/or propylene oxide (PO) units to the hydroxyl function of a hydrolyzed triglyceride or wax ester. It has been found that by controlling the number of units ETO or PO added, various properties such as solubility and melting point can be adjusted in the oil or wax. Generally, it has been found that compounds become more water soluble as the level of ethoxylation increases, but become more alcohol soluble, more oil soluble and more fluid as the level of propoxylation increases. Compounds that are ethoxylated, as well as propoxylated, acquire both water and alcohol solubility. Because ethoxylation also raises the melting point of materials, ethoxylates vary in form, depending on the level of ethoxylation. For instance, when a liquid starting material is ethoxylated with approximately 15 moles of ethylene oxide, it may become solid or semi solid at room temperature. Propoxylates, however, are more often liquids because they contain branched polyoxypropylene chains. Branching tends to keep materials fluid.

Another method of altering the melting points of oils and waxes is to add hydrogen to points of unsaturation within the oil or wax molecule. The addition of hydrogen is typically accomplished under several atmospheres of pressure at elevated temperatures and in the presence of metal catalysts, such as nickel or palladium. This hydrogenation process can be

continued until all points of unsaturation within the oil or wax molecule are saturated with hydrogen, or the reaction can be stopped at some point short of achieving a fully saturated oil or wax. The melting point of the oil or wax generally increases as a linear function of the amount of hydrogen that has been added. A hydrogenation reaction is said to yield “partially
5 hydrogenated” material when stopped short of achieving a “fully saturated” oil or wax. The melting point of these “partially hydrogenated” materials is less than the melting point of the “fully saturated” material and higher than the melting point of the starting oil or wax.

Although partial hydrogenation is a means of adjusting the melting point of an oil or wax, this partial hydrogenation process results in the formation of unwanted “trans” isomers.
10 These trans isomers have been shown to be harmful in human nutrition and have an inhibitory effect on the natural metabolic pathway whereby prostaglandins are created in the skin.

While alkoxylation is a process whereby the melting points and solubility of various oils and waxes can be modified, there is a need to expand the range of melting points of
15 alkoxyated materials. Partial hydrogenation to achieve a higher melting point is not desirable because of the formation of unwanted trans isomers. Thus, there is a need to have a broad range of melting points of alkoxyated oils and waxes with elevated melting points that are produced from natural products, where any points of unsaturation are originally in the cis configuration.

20

SUMMARY OF INVENTION

It is an object of the present invention to provide a composition that is useful for cosmetic and other applications.

It is another object of the present invention to provide an alkoxyated wax ester, where the wax ester is derived from natural products prior to being alkoxyated.

wherein the alkoxyate is prepared using ethylene oxide.

It is still yet another object of the present invention to provide the composition above wherein the alkoxyate is prepared using propylene oxide.

5 It is a further object of the present invention to provide the composition above wherein the alkoxyate is prepared using a mixture of ethylene oxide and propylene oxide.

It is yet a further object of the present invention to provide the composition above where the alkoxylation is roughly 150 mol equivalents.

It is still yet a further object of the present invention to provide an alkoxyated wax
10 ester, where the wax ester is derived from natural products prior to being alkoxyated and where the wax ester is a partially saturated wax ester, the wax ester carbon-carbon double bonds primarily in the cis configuration prior to partial saturation.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its structure
15 and its operation together with the additional object and advantages thereof will best be understood from the following description of the preferred embodiment of the present invention when read in conjunction with any accompanying drawings. Unless specifically noted, it is intended that the words and phrases in the specification and claims be given the ordinary and accustomed meaning to those of ordinary skill in the applicable art or arts. If
20 any other meaning is intended, the specification will specifically state that a special meaning is being applied to a word or phrase.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 illustrates an example reaction process for a polyalkoxylation of a hydroxy-free fatty compound. The products illustrated show only majority products, it being

recognized that many additional minority components may be produced (but in small concentrations).

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention is a novel composition that is useful as an ingredient in
5 pharmaceuticals, neutraceuticals, and cosmeceuticals. Preferably, the compositions according to the present invention are used in shampoos, hair conditioners, skin conditioners, deodorant sticks, lipsticks, toners, skin cleansers, and the like. Additionally, the compositions according to the present invention may be used as "water soluble" adhesives since their water solubility is greater than traditional, oil based, adhesives, and have sufficient
10 stickiness and tackiness to hold items while in the solid state.

Preferably, the composition of the present invention comprises a family of compositions that generally have melting points that range from 30-80 °C, preferably with melting points between 55-58°C. At room temperature (~20 °C), this family of compositions varies from pourable liquids, to soft creams, to pasty waxes, to a brittle hard material.
15 However, the preferred embodiment is solid below 55°C. The composition of the present invention may be blended with different melting point components within the family to form other products with selected melting points and specific physical properties or feel. These compounds, whether used pure or when combined with other carrier and vehicle components (including other additives or binders) can form excellent carrier and vehicles for delivery of
20 compositions for use in the cosmetic, personal care and/or pharmaceutical field, including the cosmeceutical field where cosmetic compositions also provide pharmaceutical or other therapeutic benefits. Typical materials with which the compound according to the present invention may be blended in accordance with the practice of the present invention include, but are not limited to, cosmetic oils and waxes, both natural and synthetic, including
25 hydrogenated or partially hydrogenated oils, silicon oils, mineral oils, long chain esters,

vitamins (especially vitamin E), long chain fatty acids, alcohols, cosmeceuticals, pigments, botanical extracts, esters and ethers, dimers, trimers, oligomers, and polymers, and the like. These blended compositions may of course be combined with the active ingredients intended to be delivered by the composition used in the present invention.

5 The compositions according to the present invention may be blended with other waxes, oils, thickeners, abrasive materials, pigments, and the like to prepare a “water soluble” adhesive wax. This “water soluble” adhesive wax finds use in industries where temporary adhesives are needed, especially industries where the adhesives are needed to be soluble enough in water to wash residual adhesive off of attached surfaces.

10 Preferably, the present invention has a partially saturated component. Typical alcohol-free fatty compounds are single ester waxes and oils such as jojoba oil, rice bran wax, sunflower wax, candellia wax, beeswax, corn oil wax, and the like. In their natural state (obtained directly from the source seed or nut), the liquid waxes and oils typically contain one or more double bonds (points of unsaturation). The partially saturated component of the
15 instant invention is unique in that it has a single carbon-carbon double bond that is a cis isomer, resulting from the partially saturated component being derived from a natural product. This configuration is necessarily present or implicit in some of the processes of manufacture as disclosed herein. However alternate embodiments of the present invention utilize partially saturated compounds. Partial saturation accomplished via partial
20 hydrogenation (an incomplete hydrogenation reaction) yields a quantity of the trans isomer of the carbon-carbon double bond. This is true even if the carbon-carbon double bond is originally in the cis isomer. However, when the partial saturation is accomplished through interesterification, as in the present invention, all carbon-carbon double bonds originally in the cis isomer remain in the cis isomer. Thus, since the starting unsaturated compounds used

herein contain no trans carbon-carbon double bonds, but cis carbon-carbon double bonds, any partially saturated resultant prepared through interesterification will be essentially trans free.

The present invention allows for the production of fatty compositions with predetermined physical properties, such as melting point and solubility profile. This is
5 important in the cosmetics and other industries where various formulations require components that melt either above or below normal skin or room temperatures or which are soluble in, or compatible with, a wide variety of cosmetic bases. Preferably, the desired melting characteristics of the present invention is accomplished by first adjusting the physical properties of the unsaturated fatty starting materials. This is accomplished by controlling the
10 partial saturation of the unsaturated fatty compound through transesterification. Then, when the partially saturated fatty compound has the desired physical properties (which are not necessarily the same as the physical properties of the final product), the physical properties of the product of this invention may be tuned by varying the degree and composition (ratios) of the alkoxyate reactants. The result is an array of alkoxyated wax esters whose physical
15 properties, such as melting points and solubility, are varied. Thus, the present invention is a composition that results from the polyalkoxylation of a fatty compound. Preferably, this fatty compound is derived from natural products, where any points of unsaturation are in the cis configuration, and alcohol free.

In one embodiment, the present invention is a composition that results from the
20 addition of $(\text{CH}_2\text{CH}_2\text{O})_x$ or $(\text{CH}_2\text{CH}_2\text{CH}_2\text{O})_y$ to a fully hydrogenated (saturated) alcohol-free fatty compound. This addition, in the absence of an alcohol ligand, is accomplished using a caustic catalyst (basic conditions), such as sodium methoxide (NaOCH_3), or the like to both randomize and saponify the saturated wax esters prior to alkoxylation, as will be described below.

In one example embodiment of the present invention, double bonds in the waxes first are hydrogenated (saturated) to create the fully hydrogenated alcohol-free fatty compound. Then the hydrogenated waxes are saponified. The saponification step also randomizes the naturally occurring composition of the fatty acids and fatty alcohols in the esters. Finally the hydrogenated, saponified, and randomized waxes are alkoxyated, thereby producing compositions according to the present invention.

In another embodiment of the present invention, fully hydrogenated waxes and unsaturated waxes are first mixed together. This mixture is then saponified, said saponification resulting in the randomization of the fatty acids and fatty alcohols between, and within, the hydrogenated and unsaturated waxes. The resultant compositions are finally alkoxyated, thereby producing further compositions according to the present invention.

In yet another embodiment of the present invention, different amounts of different naturally derived fatty compounds are mixed together and catalytically interesterified and then followed by alkoxylation.

In still yet another embodiment of the present invention, partially or fully hydrogenated wax esters are mixed with fatty compounds containing unsaturation in the cis isomer form. These mixtures are interesterified and alkoxyated, as described above.

By mixing different amounts of different alcohol-free fatty compounds together and interesterifying the resultant mixture, physical properties, such as melting point, hydrophilic/lipophylic balance, slip, spread, and the like may be varied and set. Alternately, the physical and chemical properties of the interesterified materials can be adjusted by addition of ethylene oxide and/or propylene oxide, in different combinations and ratios. This would adjust the level and amount of randomized, but un-alkoxyated, cis configuration, interesterified starting material remaining in the final compositions, thereby further adjusting physical and chemical properties of the compositions according to the present invention.

In one specific embodiment, 150 mole equivalents of the acyl oxide, preferably ethylene oxide is reacted with each mole of fully hydrogenated alcohol-free transesterified fatty compound, hydrogenated jojoba oil, in the caustic conditions noted above. Resulting majority products, illustrated in Figure 1, are a combination of polyalkoxylated fatty alcohols (I), polyalkoxylated fatty acids (II), polyalkoxylated diethers (III), polyalkoxylated ethers (IV), and residual unreacted material (V). Other polyalkoxylated minority products (not shown) are possible, even likely, including fully hydrogenated and randomized fatty compounds. The preferred composition according to the present invention has the total mole equivalent amount of acyl oxide added to the hydrogenated alcohol free composition,

10 $\Sigma \text{mol}_{q,n} \approx 150$. $\Sigma \text{mol}_{q,n}$ may vary from 5 to 400 total mole equivalents and still fall within the scope of the present invention.

The product compositions of the present invention have been found to have beneficial physical properties, such as melting point, hardness, solubility profile, wettability, adhesion, and the like. The preferred composition is moderately soluble in oils and produces a clear

15 solution when mixed with water, at concentrations up to 5%, may create a cloudy mixture at higher concentrations. The HLB number of the preferred composition is 9.6, with a penetrometer reading of 0.68 mm when tested at ambient (20°C) temperatures. The measured melting point range of the preferred composition is 55-58°C, and the Floratech slip test angle, in a 5% solution, is 17°.

20 Example formulations using the product of the present invention are described below.

Conditioning Shampoo

This composition lends viscosity and foam stabilization to this conditioning shampoo.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	Deionized Water	Water		Q.S.
	Sodium Laureth Sulfate	Sodium Laureth Sulfate	Chemron	28.00

	60%			
	Florasolvs PEG 150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba esters	Floratech	4.00
B.	Floraesters 20	Jojoba Esters	Floratech	0.50
	Sodium Lauryl Sulfate 30%	Sodium Lauryl Sulfate	Chemron	6.00
C.	Lactic Acid	Lactic Acid	Inolex	Q.S. to pH 4
D.	UCARE Polymer JR 30M	Polyquaternium-10	Amerchol	0.30
	Lexaine C	Cocamidopropyl Betaine	Inolex	6.00
	Lexein X-250	Hydrolyzed Collagen	Inolex	2.00
	Versene Na2	Disodium EDTA	Dow	0.10
E.	Preservative	----		Q.S.
	Fragrance	Fragrance		Q.S.
	Color (optional)			Q.S.
				100.00

Mixing Procedure:

1. Heat water to 70°C and add Sodium Laureth Sulfate and Florasolvs PEG-150 Hydrogenated Jojoba with agitation.
- 5 2. Pre-mix Phase B and add to Phase A with propeller agitation.
3. Adjust pH to 4 with Phase C and add UCARE Polymer JR 30M slowly. Add remaining ingredients of Phase D in order with propeller agitation.
4. At 40°C, add ingredients of Phase E with agitation. Cool to room temperature.

Cream Conditioning Shampoo

- 10 A cream shampoo with excellent conditioning properties contributed by PEG 150

Hydrogenated Jojoba esters.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	Deionized Water	Water		Q.S.
	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Jojoba Esters	Floratech	5.00
	Sulfochem SLS	Sodium Lauryl Sulfate	Chemron	45.00
B.	Lexemul 515	Glyceryl Stearate	Inolex	3.00

	Floramac 10	Ethyl Macadamiate	Floritech	0.50
	Floraesters IPJ	Jojoba Esters (and) Isopropyl Jojobate (and) Jojoba Alcohol	Floritech	0.50
	Floraesters 15	Jojoba Esters	Floritech	0.50
C.	Chembetaine CGF	Cocamidopropyl Betaine	Chemron	7.00
	GE Silicone SF 1188	Dimethicone Copolyol	GE Silicones	0.50
	Abil Quat 3272	Quaternium-80	Goldschmidt	0.40
D.	Citric Acid (to pH 6.5-6.8)	Citric Acid	Roche	0.10
	Fragrance	Fragrance	Shaw Mudge Co.	0.50
	Sodium Chloride	Sodium Chloride	Morton Salt	0.50
				100.00

Mixing Procedure:

1. Heat water to 70°C. Dissolve the Florasolvs PEG-150 Hydrogenated Jojoba with propeller agitation. Add the Sulfochem SLS with propeller agitation.
- 5 2. Blend all ingredients of Phase B together with heat till melted. Add Phase B to Phase A with propeller agitation.
3. Lower temperature to 50°C. Add in Phase C ingredients in order with propeller agitation.
4. Add in the Citric Acid powder with propeller agitation.
- 10 5. Add in Fragrance and Sodium Chloride with propeller agitation, and allow to cool to room temperature.

Spray Hair Detangler

This formula assists in detangling wet hair and leaving a conditioned, glossy shine contributed by use of PEG-150 Hydrogenated Jojoba esters.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	Deionized Water	Water	-----	Q.S.
	Propylene Glycol	Propylene Glycol	Dow	8.00
	Chembetaine CGF	Cocamidopropyl Betaine	Chemron	3.00
	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba Esters	Floritech	2.00

	GE Silicone Fluid 1188	Dimethicone Copolyol	GE Silicones	0.70
	Preservative	-----		Q.S.
				100.00

Mixing Procedure:

1. Add each of the ingredients in order, allowing time for each to completely dissolve.

Hair Styling Wax

- 5 Florasolvs PEG 150 Hydrogenated Jojoba esters provide water-soluble jojoba emolliency, and viscosity adjustment in this hair care product.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	White Petrolatum	Petrolatum	Penreco	28.50
	Yellow Beeswax SP 6P	Beeswax	Strahl & Pitsch	6.00
	Bentone Gel VS-5PC	Cyclomethicone (and) Quaternium-18 Hectorite (and) SD Alcohol 40	Rheox	5.00
	Florasun 90	Helianthus Annuus (Sunflower) Seed Oil	Floratech	5.00
	Floraesters 70	Jojoba Esters	Floratech	3.00
	Floraesters 60	Jojoba Esters	Floratech	7.00
	Talc Supra H	Talc	Luzenac	2.00
	Carnauba Wax #1 Yellow SP63	Copernicia Cerifera (Carnauba) Wax	Strahl & Pitsch	6.00
B.	Deionized Water	Water	-----	Q.S.
	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba Esters	Floratech	10.00
	Preservative	-----		Q.S.
C.	Fragrance (Bell J-6674-B)	Fragrance	Bell	Q.S.
	Covi-Ox T-70	Tocopherols	Cognis	1.00
		TOTAL:		100.00

Mixing Procedure:

1. Combine Phase A ingredients and heat to 90°C with propeller agitation. Mix for 20 minutes.

2. Add Phase B ingredients and mix at 80°C with propeller agitation. When Phase B is completely mixed, add slowly to Phase A with fast propeller agitation.
3. Cool to 75°C and add Phase C components. Pour into containers will still hot and fluid. Allow time to cool to room temperature before use.

5 Skin Softening Lotion

This lotion spreads easily and absorbs quickly into the skin, leaving it smooth, soft, and supple as a result of the use of PEG 150 Hydrogenated Jojoba esters.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	Floraesters 20	Jojoba Esters	Floratech	2.50
	Floramac Hawaiian Macadamia Nut Oil	Macadamia Integrifolia Seed Oil	Floratech	2.00
	Floraesters 30	Jojoba Esters	Floratech	5.00
	Lexemul 561	Glyceryl Stearate (and) PEG-100 Stearate	Inolex	3.00
	Lanette 16	Cetyl Alcohol	Cognis	1.00
	Cosmowax P	Stearyl Alcohol (and) Ceteareth-20	Croda	0.50
	SF 96 - 200 Silicone Fluid	Dimethicone	GE Silicone	0.20
	Preservative	-----		Q.S.
B.	Deionized Water	Water		Q.S.
	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba Esters	Floratech	4.00
C.	Propylene Glycol	Propylene Glycol	Dow	5.00
	Kelgin HV	Algin	CP Kelco	0.20
	Preservative	-----		Q.S.
D.	Fragrance	Fragrance		Q.S.
				100.00

Mixing Procedure:

- 10 1. Heat Phase A to 75°C with agitation
2. Heat water of Phase B to 75°C with agitation. Add Florasolvs PEG-150 Hydrogenated Jojoba.

3. Pre-mix Phase C with moderate agitation and add slowly to Phase B with moderate high-speed agitation. Mix for 15 minutes.
4. Add Phase A slowly to Phase BC with propeller agitation.
5. Force cool to 40°C with agitation. Add fragrance (if desired) and mix with propeller agitation to room temperature.

Deodorant Stick

Florasolvs PEG-150 Hydrogenated Jojoba esters clarify and improve the application properties of this clear deodorant stick.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
A.	Deionized Water	Water		Q.S.
	Chloracel	Sodium Aluminum Chlorohydroxy Lactate	Reheis	17.00
B.	Propylene Glycol, USP	Propylene Glycol	Dow	33.00
	Irgasan DP300	Triclosan	Ciba-Geigy	0.30
	Sodium Stearate C-7	Sodium Stearate	Crompton	8.00
C.	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba Esters	Floratech	5.00
	Carsamide CA	Cocamide DEA	Lonza	2.00
	Polyglycol E-1450	PEG-32	Dow	4.20
D.	Fragrance	Fragrance		Q.S.
	Color (optional)			Q.S.
		TOTAL:		100.00

10 Mixing Procedure:

1. Heat water of Phase A to 75°C. Add Chloracel with agitation to dissolve. Cool to 65°C.
2. Combine Phase B and heat to 75°C with agitation.
3. Add the ingredients of Phase C to Phase B in the given order and mix for 15 minutes. Cool to 65°C.
- 15 4. Add Phase BC to A with agitation and mix until uniform.
5. Add color and fragrance.
6. Fill at 62-65°C. Cool in containers at room temperature.

Adhesive Composition

Florasolvs PEG-150 Hydrogenated Jojoba esters may be used essentially by themselves, or in blended with other waxes, oils, thickeners, abrasive materials, pigments, and the like to prepare a “water soluble” adhesive wax. These adhesives are an essentially solvent-free water-soluble ester based adhesive. The adhesive composition imparts soft handle and hydrophilic/lipophylic properties as well as good resiliency and crease resistance. Further, these adhesives show good compatibility with various resins, and therefore are suitable for shape-memory finishing of cellulose fiber and the like.

Phase	Trade Name	INCI Name	Supplier	%wt/wt
	Florasolvs PEG-150 Hydrogenated Jojoba	PEG-150 Hydrogenated Jojoba Esters	Floratech	97.00
	PEG-12 Carnauba	PEG-12 Carnauba	Koster-Keunen	3.00
		TOTAL:		100.00

10 Mixing Procedure:

1. Combine Florasolvs PEG-150 Hydrogenated Jojoba with PEG-12 Carnauba and heat to 75°C with agitation.
2. Fill at 62-65°C. Cool in containers at room temperature.

In addition to the essential ingredients in the compositions of the present invention, further material may be present in the composition for functional or aesthetic reason. Antioxidants, including tocotrienols (compounds homologous to tocopherols that differ by the presence of three unsaturated bonds in the phytyl side chain), and oryzanol (a mixture of ferulic acid esters of sterols, e.g., beta-sitosteryl ferulate and methyl ferulate, and triterpene alcohols, e.g., 24-methylenecycloartenyl ferulate; see Bailey's Industrial Oil and Fat Products, 4th Ed., John Wiley, New York, 1979, volume 1, pages 407 to 409) may be present. Fragrances, colorants (e.g., dyes or pigments), topically applied medications, UV absorbers,

whitening agents, emulsifying agents, binders, scrubbing particulates, and the like may be present.

Fatty elements used in combination with the present invention can be selected from mineral oils like paraffin or petroleum oils, silicon oils, vegetable oils like coconut, almond, 5 apricot, corn, jojoba, olive, avocado, sesame, palm, eucalyptus, rosemary, lavender, pine, thyme, mint, cardamon, orange blossoms, soy beans, bran, rice, colza, and castor oils, animal oils and fats like tallow, lanolin, butter oil, fatty acid esters, fatty alcohol esters, waxes whose melting point is the same as the skin's (animal waxes like beeswax, botanical waxes such as carnauba or candelilla waxes, mineral waxes like micro-crystalline waxes and synthetic 10 waxes like polyethylene or silicone waxes). All acceptable oils used in cosmetology can be used, like the ones that have been mentioned in the CTFA's book, Cosmetic Ingredient Handbook, First edition, 1988, The Cosmetic, Toiletry and Fragrance Association, Inc., Washington (hereinafter, "CTFA").

Cosmetically or dermatologically active substances may be added to the composition 15 of the present invention, meaning active ingredients chosen from anti-acne agents, anti-microbial agents, anti-perspiration agents, astringents, deodorants, hair removers, external analgesics, agents for hair conditioning, skin conditioning, sun protection, vitamins, catechines, flavonoids, ceramides, fatty substances, polyunsaturated fatty acids, essential fatty acids, keratolytic agents, enzymes, anti-enzymes, moisteners, anti-inflammatory substances, 20 detergents, perfumes, and mineral substances for synthetic coverings. These substances may represent from 1 to 20% by weight of the total weight of the composition.

Detergent or foaming agents, for example used in combination with the preferred embodiments, may include disodic cocoamphodiacetate salts; lauroylether sulfosuccinate disodic salts; the vegetable protein acylates; the cocoyl glutamate triethanolamine salts; the

lauroyl sarcosinate sodium salts; the glucoside decyl-ethers; and the sodium sulfate lauroyl ethers.

Pasty active compounds like lanolin by-products (acetyl lanolin, lanolin, and lanolin alcohols; cholesterol by-products, like cholesterol esters (12 cholesteryl hydroxy stearate);
5 pentaerythritol hydroxylated esters, linear mono-esters like butyl stearate, arachidyl propionate or stearyl heptanoate, and triglycerides with a fatty chain less than C_{16} can also be used. These substances may be water-soluble, lipid-soluble, or lipid-soluble and water soluble at the same time, or dispersible. They can be chosen from the compounds that are found in the CTFA dictionary at pages 51 to 101.

10 Surface active agents, cationic, anionic, non-ionic and/or Zwitterionic may be used in combination with the preferred embodiments of the present invention. These surface agents can be chosen, for example, from the hydrophilic surface agents, like glycols, such as hexylene glycol, butylene-1,2 glycol, ethyl-2-hexyl sulfosuccinate; oxyethylene octylphenol (and the salts derived from cocoyl and lauroyl collagen, sorbitan palmitate, and the
15 polyoxyethylene byproducts of sorbitol palmitate esters, salts of fatty chain quaternary ammonium. Suitable anionic surfactants which may be used include water-soluble alkali metal or ammonium salts having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic surfactants are sodium or ammonium alkyl sulfates, especially those obtained by sulfating higher (C_8 - C_{18}) alcohols produced, for example, from
20 tallow or coconut oil; alkyl (C_9 - C_{20}) benzene sulfonates, particularly sodium linear secondary alkyl (C_{10} - C_{15}) benzene sulfonates; alkyl glyceryl ether sulfates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum; coconut oil fatty monoglyceride sulfates and sulfonates; salts of sulfuric acid
25 esters of higher (C_8 - C_{18}) fatty alcohol-alkylene oxide, particularly ethylene oxide reaction

products; the reaction products of fatty acids such as coconut fatty acids esterified with isoethionic acid and neutralized with sodium hydroxide; sodium and potassium salts of fatty acid amides of methyl taurine; alkane monosulfonates such as those derived from reacting alpha-olefins (C₈-C₂₀) with sodium bisulfite and those derived from reacting paraffins with SO₂ and Cl₂ and then hydrolyzing with a base to produce a random sulfonate; and olefin sulfonates which term is used to describe the material made by reacting olefins, particularly C₁₀-C₂₀ alpha-olefins, with SO₃ and then neutralizing and hydrolyzing the reaction product. The preferred anionic surfactants are sodium or ammonium (C₁₀-C₁₈) alkyl sulfates and (C₁₀-C₁₈) alkyl polyethoxy (1-11 EO, ethylene oxide) sulfates and mixtures thereof having differing water solubilities.

Particularly preferred anionic surfactants comprise a mixture of a C₁₀-C₁₈ alkyl sodium or ammonium sulfate or sulfonate or a C₁₄-C₁₈ alpha-olefin sodium or ammonium sulfonate (AOS) and a C₈-C₁₂ alkyl polyethoxy (2-4 EO) sodium or ammonium sulfate. Mixtures containing a major amount of the alkyl sulfates, olefin sulfonates or alkyl alkoxy sulfates with aryl sulfonates such as sodium cumene sulfonate, sodium xylene sulfonate and sodium benzene sulfonate are also optional.

The amount of anionic surfactant present in the composition will generally range from about 0 or 1% or 4 to 12% by weight (total ingredients) by weight. The amphoteric or Zwitterionic surfactant, may optionally be present at a level of at least about 0.1 or at least about 0.25 percent by weight of the total composition, per 1 part by weight of the content of anionic surfactant present in the composition.

Examples of amphoteric surfactants that may be used in combination with the composition of the invention are betaines and compounds that can be broadly described as derivatives of aliphatic secondary and tertiary amines in which the aliphatic radical can be straight chain or branched and wherein one of the aliphatic substituent contains from about 8

to 18 carbon atoms and one contains an ionic water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. Examples of compounds falling within this definition are sodium 3-dodecylaminopropionate, sodium 3-dodecylaminopropane sulfonate, N-alkyltaurines, such as prepared by reacting dodecylamine with sodium isethionate, N-
5 higher alkyl aspartic acids and the products sold under the trade name "Miranol".

Makeup or cosmetic compositions comprising the present invention may also contain as an optional ingredient, a film forming skin tightening agent, particularly a plant derived biological polysaccharide cosmetic ingredient that may be combined with a casein hydrolysate.

10 The polysaccharides that can be used in the practice of the invention include, for example, lecithin, pectin, karaya gum, locust bean gum, xanthan gum and mixtures thereof. The polysaccharides are preferably used in the present compositions in combination with a casein hydrolysate.

Suitable co-emulsifiers, which may be used in combination with compositions
15 according the present invention, are both known w/o (water in oil) and o/w (oil in water) emulsifiers. Typical examples of fats are glycerides while suitable waxes include inter alia beeswax, paraffin wax or microwaxes. Suitable thickeners are, for example, crosslinked polyacrylic acids and derivatives thereof, polysaccharides, more particularly xanthan gum, guar, agar, alginates and tyloses, carboxymethyl cellulose and hydroxyethyl cellulose, also
20 fatty alcohols, monoglycerides and fatty acids, polyacrylates, polyvinyl alcohol and polyvinyl pyrrolidone. In the context of the invention, biogenic agents are, for example, plant extracts, protein hydrolysates and vitamin complexes. Typical film formers are, for example, polyvinyl pyrrolidone, vinyl pyrrolidone/vinyl acetate copolymers, polymers of the acrylic acid series, quaternary cellulose derivatives and similar compounds. Suitable preservatives are,
25 for example, formaldehyde solution, p-hydroxybenzoate or sorbic acid. Suitable pearl esters

are, for example, glycol distearic acid esters, such as ethylene glycol distearate, and also fatty acids and fatty acid monoglycol esters. The dyes used may be selected from many of the substances that are permitted and suitable for cosmetic purposes, as listed for example in the publication "Kosmetische Farbmittel" of the Farbstoffkommission der Deutschen pages 81-106. These dyes are typically used in concentrations of 0.001 to 0.1% by weight, based on the mixture as a whole.

The total percentage content of auxiliaries and additives may be 1 to 50% by weight and may be 5 to 40% by weight, based on the formulation. The formulations may be produced in known manner, i.e. for example by hot, cold, hot/cold or PIT emulsification.

These are purely mechanical processes that do not involve a chemical reaction. The cosmetic and/or pharmaceutical formulations may have a water content of 25 to 95% by weight and preferably 50 to 75% by weight.

The following list of cosmetic category codes identifies fields of use for the cosmetic compositions and carriers of the present invention.

TABLE 1

15	FDA cosmetic category codes
20	01. Baby products. A. Baby shampoos B. Lotions, oils, powders and creams C. Other baby products
25	02. Bath preparations A. Bath oils, tablets, salts and beads B. Bubble Baths C. Bath capsules D. Other bath preparations
30	03. Eye makeup preparations A. Eyebrow pencil B. Eyeliner C. Eye shadow D. Eye lotion E. Eye makeup remover F. Mascara
35	G. Other eye makeup preparations

- 04. Fragrance preparations
 - A. Cologne and toilet waters
 - B. Perfumes
 - C. Powders (dusting and talcum, excluding aftershave talc)
 - 5 D. Sachets
 - E. Fragrance sticks
 - F. Other fragrance preparations
- 05. Hair preparations (non-coloring)
 - A. Hair conditioner
 - 10 B. Hair spray (aerosol fixatives)
 - C. Hair straighteners
 - D. Permanent waves
 - E. Rinses (non-coloring)
 - F. Shampoos (non-coloring)
 - 15 G. Tonics, dressings, and other hair grooming aids
 - H. Wave sets
 - I. Spiking gels, pomades and leave-in conditioners
 - J. Other hair preparations
- 06. Hair coloring preparations
 - 20 A. Hair dyes and colors (all types requiring caution statements and patch tests)
 - B. Hair tints
 - C. Hair rinses (coloring)
 - D. Hair shampoos (coloring)
 - 25 E. Hair color sprays (aerosol)
 - F. Hair lighteners with color
 - G. Hair bleaches
 - H. Other hair coloring preparations
- 07. Makeup preparations (not eye)
 - 30 A. Blushers (all types)
 - B. Face powders
 - C. Foundations
 - D. Leg and body paints
 - E. Lipstick
 - 35 F. Makeup bases
 - G. Rouges
 - H. Makeup fixatives
 - I. Other makeup preparations
- 08. Manicuring preparations
 - 40 A. Basecoats and undercoats
 - B. Cuticle softeners
 - C. Hair creams and lotions
 - D. Nail extenders
 - E. Nail polish and enamel
 - 45 F. Nail polish and enamel removers
 - G. Other manicuring preparations
- 09. Oral hygiene products
 - A. Dentifrices (aerosol, liquid, pastes and powders)
 - B. Mouthwashes and breath fresheners (liquids and sprays)

- C. Other oral hygiene products
- 10. Personal cleanliness
 - A. Bar soaps and detergents
 - B. Deodorants (underarm)
 - 5 C. Douches
 - D. Feminine hygiene deodorants
 - E. Synthetic Detergent Preparations (Syn-Det Bars)
 - F. Other personal Cleanliness products
- 11. Shaving preparations
 - 10 A. Aftershave lotion
 - B. Beard softeners
 - C. Men's talcum
 - D. Preshave lotions (all types)
 - E. Shaving cream (aerosol, brushless and lather)
 - 15 F. Shaving soap (cakes, sticks, etc.)
 - G. Other shaving preparations products
- 12. Skin care preparations (creams, lotions, powder and sprays)
 - A. Cleansing (cold creams, cleansing lotions, liquids and pads)
 - B. Depilatories
 - 20 C. Face and neck (excluding shaving preparations)
 - D. Body and hand (excluding shaving preparations)
 - E. Foot powders and sprays
 - F. Moisturizing
 - G. Night
 - 25 H. Paste masks (mud packs)
 - I. Skin fresheners
 - J. Other skin products
- 13. Suntan preparations
 - 30 A. Suntan gels, creams and liquids
 - B. Indoor tanning preparations
 - C. Self-Tanning Solutions and lotions
 - D. Other suntan preparations

The preferred embodiment of the invention is described above in the Drawings and Description of Preferred Embodiments. While these descriptions directly describe the above

embodiments, it is understood that those skilled in the art may conceive modifications and/or

variations to the specific embodiments shown and described herein. Any such modifications

or variations that fall within the purview of this description are intended to be included

therein as well. Unless specifically noted, it is the intention of the inventor that the words

and phrases in the specification and claims be given the ordinary and accustomed meanings

to those of ordinary skill in the applicable art(s). The foregoing description of a preferred

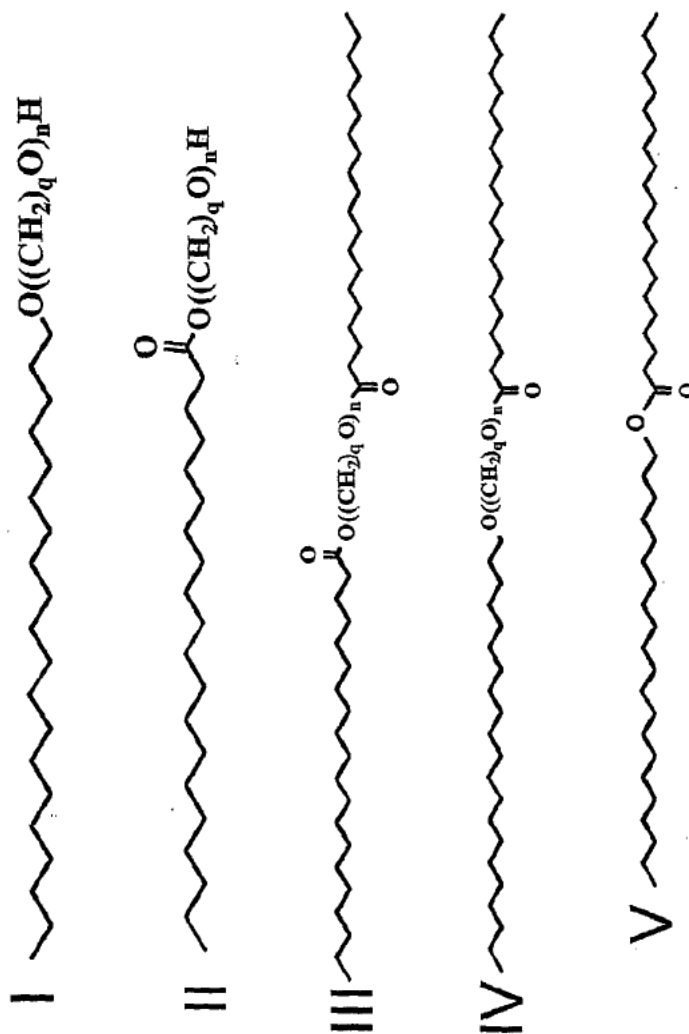
embodiment and best mode of the invention known to the applicant at the time of filing the application has been presented and is intended for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and many modifications and variations are possible in the light of the above teachings. The

5 embodiment was chosen and described in order to best explain the principles of the invention and its practical application and to enable others skilled in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

Claims:

What is claimed is:

1. A composition comprising an alkoxylated wax ester that is an ethoxylated and/or propoxylated fully hydrogenated jojoba wax ester having 5 to 400 mol equivalents of the total being ethylene oxides and propylene oxides and the wax ester having carbon-carbon double bonds in the cis configuration prior to full saturation and alkoxylation.
2. The composition according to claim 1 wherein the alkoxylate is ethylene oxide.
3. The composition according to claim 1 wherein the alkoxylate is propylene oxide.
4. The composition according to claim 1 wherein the alkoxylate is a mixture of ethylene oxide and propylene oxide.
5. The composition according to claim 2 where the alkoxylation is roughly 150 mol equivalents.
6. The composition according to claim 3 where the alkoxylation is roughly 150 mol equivalents.
7. The composition according to claim 4 where the alkoxylation is roughly 150 mol equivalents.

Figure 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/37112

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C11D 3/37; B01F 17/34; A61K 7/06

US CL : 510/119, 153, 222, 421, 437, 475, 505; 424/502, 70.1, 70.11

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 510/119, 153, 222, 421, 437, 475, 505; 424/502, 70.1, 70.11

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WEST 2.0

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/0181600 A1 (BROWN et al) 25 September 2003 (25.09.2003), page 4, paragraphs [0043]-[0058], pages 8-9, claims 1-36.	1-7
X	US 6,280,746 B1 (ARQUETTE et al) 28 August 2001 (28.08.2001), col. 11, lines 5-65.	1-2 and 5-7
X	US 6,299,891 B1 (LEVERETT) 9 October 2001 (09.10.2001), col. 3, lines 47-65.	1-2
X	US 6,432,428 B1 (ARQUETTE et al) 13 August 2002 (13.08.2002), col. 11, lines 1-62.	1-2 and 5-7

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

12 April 2004 (12.04.2004)

Date of mailing of the international search report

07 MAY 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Brian P Mruk

Telephone No. (703) 308-0661

Brian P. Mruk

Form PCT/ISA/210 (second sheet) (July 1998)

Vantage Exhibit 1002

Page 163 of 1215

CARGILL 00000188

Electronic Acknowledgement Receipt

EFS ID:	25862185
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson
Filer Authorized By:	
Attorney Docket Number:	FloraTech002
Receipt Date:	23-MAY-2016
Filing Date:	19-DEC-2014
Time Stamp:	22:16:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS002.pdf	1035107 e16ec7372208fe793e62af6dc844f5d883058a65	no	4

Warnings:

Information:

Vantage Exhibit 1002

Page 164 of 1215

CARGILL 00000189

2	Foreign Reference	WO2001072683filed.pdf	132681 cdad9764bdc8cb0487b381e3f843c9301db a156b	no	5
Warnings:					
Information:					
3	Foreign Reference	WO2005061686filed.pdf	1205774 0973f1cf061cc455ad9d9b2e5d2a374be14e 0016	no	27
Warnings:					
Information:					
Total Files Size (in bytes):			2373562		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/578,075	12/19/2014	Jeff Addy	FloraTech002

CONFIRMATION NO. 2053

PUBLICATION NOTICE



OC00000003892012

93756

Adam R. Stephenson, LTD.
40 W. Baseline Rd., Ste 101
Tempe, AZ 85283

Title:Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

Publication No.US-2016-0177349-A1

Publication Date:06/23/2016

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PLUS Search Results for S/N 14578075, Searched Tue Sep 20 11:01:59 EDT 2016

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

20160177349 91

20160177350 91

9388098 74

20150210855 74

4925581 60

5282989 60

5888947 60

5986119 60

6013818 60

6180668 60



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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/578,075	12/19/2014	Jeff Addy	FloraTech002	2053
93756	7590	10/07/2016		
Adam R. Stephenson, LTD. 40 W. Baseline Rd., Ste 101 Tempe, AZ 85283			EXAMINER SRIVASTAVA, KAILASH C	
			ART UNIT	PAPER NUMBER
			1657	
			NOTIFICATION DATE	DELIVERY MODE
			10/07/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ipdocket@iptech.law
adam@iptech.law

Office Action Summary	Application No. 14/578,075	Applicant(s) ADDY ET AL.	
	Examiner KAILASH C. SRIVASTAVA	Art Unit 1657	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/19/2014.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☐ Claim(s) ____ is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☐ Notice of References Cited (PTO-892) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____. | 4) ☐ Other: ____. |

Art Unit: 1657

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Claims Status

Claim set filed 12/19/2014 is acknowledged and entered. Currently claims 1-20 are presented for examination.

Informals

The instant Non-Provisional application (i.e., 14/578,075) currently under USPTO has been assigned to Kailash C. Srivastava in Art Unit 1657. To aid in correlating any papers for the instant application (i.e., 14/578,075), all further correspondence regarding the instant application (i.e., 14/578,075) should be directed to Examiner Kailash C. Srivastava in Art Unit 1657.

Restriction/Election

Restriction to one of the following inventions is required under 35 U.S.C. §121:

Group I consisting of claims 1-7, drawn to a method of trans-esterifying wax esters to obtain higher oxidative stability index (OSI) in the transesterified feedstock, classified in CPC C12P 41/003 for example.

Group II consisting of claims 8-13, drawn to a method of trans-esterifying wax esters with lipase to achieve greater than 98% yield of the transesterification reaction, classified in CPC C12N 9/20 for example.

Art Unit: 1657

Group III consisting of claims 14-20, drawn to a method of transesterifying wax esters with lipase to achieve greater than 4001 kilograms of trans esterified product for every kilogram of the immobilized lipase catalyst, classified in CPC C12P 7/6436 for example.

Inventions are Independent or Distinct

The inventions are distinct, each from the other because of the following reasons:

Inventions in Groups I –III each are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different designs, modes of operation, and effects (M.P.E.P. § 802.01 and § 806.06). In the instant case, the different inventions, for example inventions disclosed in claims encompassed in inventions in Group I is directed to achieve higher OSI in the product; while invention encompassed in Group III is a method to achieve higher product yield per unit weight of catalyst. Accordingly, e.g., said two methods have different modes of operation, they have different functions, and/or they have different effects. One would not have to practice the various methods at the same time to practice just one method alone (M.P.E.P. § 806.04, M.P.E.P. § 808.01). Furthermore, said two methods have a different classification status.

Restriction for examination purposes as indicated above is proper because all the inventions listed above in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because at least the following reason(s) apply:

Art Unit: 1657

- the inventions have acquired a separate status in the art in view of their different classification;
- the inventions have acquired a separate status in the art due to their recognized divergent subject matter; and
- the inventions require a different field of search (e.g., searching different classes/subclasses or electronic sources, or employing different search strategies or search queries).

In the instant situation, each of the inventive Groups have a different classification status. Accordingly, they have acquired a different status from each other.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of an invention to be examined even though the requirement may be traversed (37 C.F.R. §1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 C.F.R. §1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Art Unit: 1657

Should Applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. §103(a) of the other invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 C.F.R. § 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 C.F.R. § 1.48(b) and by the fee required under 37 C.F.R. § 1.17(i).

The examiner has required restriction between product or apparatus claims and process claims. Where applicant elects claims directed to the product/apparatus, and all product/apparatus claims are subsequently found allowable, withdrawn process claims that include all the limitations of the allowable product/apparatus claims should be considered for rejoinder. All claims directed to a nonelected process invention must include all the limitations of an allowable product/apparatus claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product/apparatus claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37

Art Unit: 1657

C.F.R. §1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. §§101, 102, 103 and 112. Until all claims to the elected product/apparatus are found allowable, an otherwise proper restriction requirement between product/apparatus claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product/apparatus claim will not be rejoined. See M.P.E.P. § 821.04. Additionally, in order for rejoinder to occur, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product/apparatus claims. Failure to do so may result in no rejoinder. Further, note that the prohibition against double patenting rejections of 35 U.S.C. §121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See M.P.E.P. § 804.01.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAILASH C. SRIVASTAVA whose telephone number is (571)272-0923. The examiner can normally be reached on Monday-Thursday 6:30 to 5:00, U.S., Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Louise W. Humphrey can be reached on 571-272-5543. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1657

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KAILASH C. SRIVASTAVA
Examiner
Art Unit 1657

/Kailash C. Srivastava/
Examiner, Art Unit 1657



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BIB DATA SHEET

CONFIRMATION NO. 2053

SERIAL NUMBER 14/578,075	FILING or 371(c) DATE 12/19/2014 RULE	CLASS 435	GROUP ART UNIT 1657	ATTORNEY DOCKET NO. FloraTech002		
APPLICANTS International Flora Technologies, Ltd., Chandler, AZ; INVENTORS Jeff Addy, Chandler, AZ; Clay Daly, Chandler, AZ; James H. Brown, Chandler, AZ; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 01/08/2015						
Foreign Priority claimed ☐ Yes ☐ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged <u>Examiner's Signature</u>		☐ Met after Allowance <u>Initials</u>	STATE OR COUNTRY AZ	SHEETS DRAWINGS 4	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS Adam R. Stephenson, LTD. 40 W. Baseline Rd., Ste 101 Tempe, AZ 85283 UNITED STATES						
TITLE Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives						
FILING FEE RECEIVED 800	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

AMENDMENT/REPLY

Applicant: Jeff Addy

Docket No: FLORATECH002

Examiner: SRIVASTAVA, KAILASH C

Ser. No: 14578075

Filed: December 19, 2014

Group Art Unit: 1657

Title: Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives

**RESPONSE TO OFFICE ACTION
DATED OCTOBER 7, 2016**

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madam:

The following is responsive to the Office Action mailed October 7, 2016. Applicant respectfully requests reconsideration of the application in view of the following:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 4 of this paper.

AMENDMENTS TO THE CLAIMS

Please cancel claims 8-20, as indicated among the following complete set of pending claims:

1. (Original) A process for transesterifying wax esters, the process comprising:

 providing a feedstock comprising wax esters;

 contacting the feedstock with a lipase;

 catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product;

 wherein an oxidative stability index (OSI) of the transesterified product is greater than an OSI of the feedstock.
2. (Original) The process of claim 1, wherein the transesterified product comprises no methyl esters.
3. (Original) The process of claim 1, wherein the feedstock further comprises an antioxidant and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the antioxidant in the feedstock.
4. (Original) The process of claim 3, wherein the feedstock further comprises a skin conditioning agent and a volatile compound and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of

removing and degrading the skin conditioning agent and the volatile compound in the feedstock.

5. (Original) The process of claim 1, wherein the wax esters of the feedstock are jojoba wax esters.

6. (Original) The process of claim 5, wherein the jojoba wax esters further comprise hydrogenated jojoba wax esters.

7. (Original) The process of claim 6, wherein a dropping point of the transesterified product is greater than a dropping point of the feedstock and the dropping point of the transesterified product increases as a percentage of hydrogenated jojoba wax esters in the feedstock increases.

8-20. (Canceled).

REMARKS

Claims 1-20 are currently pending in the application. Applicants have canceled claims 8-20. Applicants request reconsideration of the application in light of the following remarks.

Restriction Requirement

Responsive to the restriction requirement indicated by the Examiner, Applicants provisionally elect Group I, claims 1-7. The election is made without traverse. No correction to the inventorship is required.

Regarding Doctrine of Equivalents

Applicants hereby declare that any amendments herein that are not specifically made for the purpose of patentability are made for other purposes, such as clarification, and that no such changes shall be construed as limiting the scope of the claims or the application of the Doctrine of Equivalents.

CONCLUSION

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

Date: 12/7/2016

By: /Adam Stephenson/
Adam. R. Stephenson
Reg. No. 58349

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40 W. Baseline Rd., Ste. 101
Tempe, AZ 85283
480.264.6075
480.718.8336 fax
Adam@IPTech.Law

Electronic Acknowledgement Receipt

EFS ID:	27727924
Application Number:	14578075
International Application Number:	
Confirmation Number:	2053
Title of Invention:	Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives
First Named Inventor/Applicant Name:	Jeff Addy
Customer Number:	93756
Filer:	Adam Reid Stephenson
Filer Authorized By:	
Attorney Docket Number:	FloraTech002
Receipt Date:	07-DEC-2016
Filing Date:	19-DEC-2014
Time Stamp:	18:25:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response to Election / Restriction Filed	RestrictionRequirement.pdf	104021	no	5
			efef110f29519812844390010e1e88b764112d5c		

Warnings:

Vantage Exhibit 1002

Page 182 of 1215

CARGILL 00000207

Information:	
Total Files Size (in bytes):	104021
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/578,075	12/19/2014	Jeff Addy	FloraTech002	2053
93756	7590	04/26/2017	EXAMINER	
Adam R. Stephenson, LTD. 8350 E Raintree Dr., Ste 245 Scottsdale, AZ 85260			SRIVASTAVA, KAILASH C	
			ART UNIT	PAPER NUMBER
			1657	
			NOTIFICATION DATE	DELIVERY MODE
			04/26/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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adam@iptech.law

Office Action Summary	Application No. 14/578,075	Applicant(s) ADDY ET AL.	
	Examiner KAILASH C. SRIVASTAVA	Art Unit 1657	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/07/2016.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-7 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) _____ is/are allowed.
- 7) ☒ Claim(s) 1-7 is/are rejected.
- 8) ☐ Claim(s) _____ is/are objected to.
- 9) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date 01/13/2015 & 05/23/2016.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 4) ☐ Other: _____.

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

4

DETAILED ACTION

Acknowledgement

Response and amendment filed 12/07/2016 to office action requiring election/restriction mailed 10/07/2016 is acknowledged and entered.

8

Claims Status

According to the amendment filed 12/07/2016 in the instant application following is the current status of claims:

12

8-20 have been cancelled.

1-7 are presented for examination.

Restriction /Election

16

Election without traverse to further prosecute Group I invention encompassing claims 1-7 filed 12/07/2016 is acknowledged and entered.

Election was made without traverse in the reply filed on 12/05/2016.

The requirement is still deemed proper and is therefore made FINAL.

20

Claims 1-7 are examined on merits.

Information Disclosure Statement (IDS)

24

IDSs respectively filed 01/13/ 2015 and 05/23/2016 are acknowledged, have been made of record, considered and duly initialed 8 sheets of appropriate PTO form are enclosed with the instant Office Action.

Several non-patent literature references cited at pages 2-6 of the IDS filed 05/23/2015 are incomplete because either said references lack the page numbers or number of page, or if from a book, the appropriate section of the book or monograph with page numbers and author names is not recited. Furthermore, there are blank lines on said IDS (e.g., Page 4, Numbers 31-32). Please complete the IDS and re-submit it for examiner's consideration.

35 U.S.C. §103 Rejections

In the event the determination of the status of the application as subject to AIA 35 U.S.C. §102 and §103 (or as subject to pre-AIA 35 U.S.C. §102 and §103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. §103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. §103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 C.F.R. §1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the

examiner to consider the applicability of pre-AIA 35 U.S.C. §103(c) and potential pre-AIA 35 U.S.C. §§102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. §103(a).

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

4 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
- 8 3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-7 rejected under 35 U.S.C. §103 as being unpatentable over **Compton**
12 **et al** (WO2001/72683 A1) in view of **Kodali et al** (US Patent 2005/0176597 A1) and **Brown et al** (WO 2005061686 A1).

Claims 1-7 are examined to the extent that claims 1-7 are drawn to a process to transesterify wax esters with a lipase, wherein wax esters are from Jojoba. No methyl
16 esters in the transesterified product, antioxidants in jojoba are not catalyzed, OSI and dropping point in transesterified product is higher than OSI and dropping point in feedstock.

Regarding claims 1-7, **Compton et al.**, each the limitations in claim:

- 20 1 - teaching a process for transesterifying wax esters applying coumarate esters, i.e., transesterification process using coumarate, a wax ester in to coumaryl-substituted acylglycerols from vegetable oils (abstract, Lines 1-3; page 5, Lines 3-10), especially jojoba oil (Page 5, Line 6 ; page 6, Lines 1-14; Scheme

I, Left side; ; claim 14); contacting the feedstock with a lipase thereby catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product under conditions that permit transesterification of said ester by the lipase catalyst (See, claim 14).

2 - formula I teaches the product of the transesterification comprising no methyl esters (Page 3, Lines 14-27).

3 - defines an antioxidant in the skin product (Page 9, Line 23)

4 – feedstock further comprises a skin conditioning agent, e.g., use of an ester of ferulic acid to create a ferulyl-substituted acylglycerols, which includes properties suitable for use as sunscreen agents (i.e., a skin conditioning agent; Abstract, Lines 2-4; page 3, Lines 14-27; page 5, Lines 3-6; page 6, Lines 1-14) and a volatile compound. The reaction may be carried out using toluene solvent (i.e., a volatile compound; page 5, Lines 25-26) and catalytically transesterifying the wax esters in the feedstock with the lipase further comprises catalytically transesterifying without one of removing and degrading the skin conditioning agent, (i.e., the ferulyl-substituted acylglycerols are suitable for use as sunscreen agents; Abstract, Lines 2-4) and without degrading said compounds (Page 11, Lines 4-17).

5 - the wax esters are from a Markush Group of oils including jojoba oil (Page 9, Line 10).

Compton et al., are silent regarding limitations in claims 1 and 6-7 with respect to oxidative stability index (OSI) of the transesterified product is greater than an OSI of the feedstock, hydrogenated jojoba wax esters, antioxidants of

the feed stock not oxidized as a result of lipase mediated transesterification and the values of dropping point .

Kodali et al., teach an oxidative stability index (OSI) of the transesterified product is greater than an OSI of the feedstock because when an oil is made by transesterification, the oxidative stability of the transesterified oil is greater than that of the starting oil, which is measured via an oxidative stability index (Paragraph (i.e., ¶); 0040, Lines 12-16: ¶0041.Lines 2-21).

Brown et al., teach jojoba ester as comprised of hydrogenated jojoba wax ester (Page 9, Lines 1-3). Furthermore, dropping point of the transesterified product is greater than the dropping point of the feedstock and the dropping point of the transesterified product increases as a percentage of hydrogenated jojoba wax esters in the feedstock increases. Brown et al., additionally teach that as the percentage of hydrogenated jojoba wax esters in the feedstock increase, the melting point of the oil or wax generally increases linearly as a function of the amount of hydrogen that has been added. Accordingly, the use of fully hydrogenated jojoba oil improves the melting point of the product (Page 3, Lines 3-5' Page 9, Lines 11-14).

It would have been *prima facie* obvious to a person of ordinary skill in the art prior to the time when the invention was made and said artisan would have been motivated to combine the teachings from Compton et al., with those from Kodali et al., and Brown et al., because:

said person would have supplemented the process of Compton et al., with the teachings of Kodali et al., and Brown et al., references to obtain a process that would have resulted in an improved esterification process that improves oxidative stability with

the use of antioxidants and also increase in the dropping point of transesterified product. This is because, Kodali et al., remedy the silence in Compton et al., process of higher oxidative index in the transesterified product. Furthermore, Brown et al., remedy the silence in Compton et al., process to obtain a transesterified product with higher hydrogenation and to result in a superior wax ester to provide higher dropping point. Thus, Kodali et al., embellish the process of Compton et al., with higher oxidative transesterified products and Brown et al., embellish the Compton et al process to yield a product that is an excellent carrier and vehicles for delivery of compositions for use in the cosmetic, personal care and/or pharmaceutical field, including the cosmeceutical field where cosmetic compositions also provide pharmaceutical or other therapeutic benefits.

From the teachings of the cited references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

Conclusion

No Claims are allowed.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAILASH C. SRIVASTAVA whose telephone number is

(571)272-0923. The examiner can normally be reached on Monday-Thursday 7:30 to 6:00, U.S., Eastern Time.

Examiner interviews are available via telephone, in-person, and video

- 4 conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

- 8 If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Louise W. Humphrey can be reached on 571-272-5543. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

- 12 Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should
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20

KAILASH C. SRIVASTAVA
Examiner
Art Unit 1657

/Kailash C. Srivastava/
Examiner, GAU 1657



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CONFIRMATION NO. 2053

SERIAL NUMBER 14/578,075	FILING or 371(c) DATE 12/19/2014 RULE	CLASS 435	GROUP ART UNIT 1657	ATTORNEY DOCKET NO. FloraTech002	
APPLICANTS International Flora Technologies, Ltd., Chandler, AZ; INVENTORS Jeff Addy, Chandler, AZ; Clay Daly, Chandler, AZ; James H. Brown, Chandler, AZ; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 01/08/2015					
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and /KAILASH C SRIVASTAVA/ Acknowledged Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY AZ	SHEETS DRAWINGS 4	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS Adam R. Stephenson, LTD. 8350 E Raintree Dr., Ste 245 Scottsdale, AZ 85260 UNITED STATES					
TITLE Processes and Systems for Catalytic Manufacture of Wax Ester Derivatives					
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Inventor Search

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L2      1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  WAX ESTERS/CN
L4      1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  JOJOBA WAX/CN
L6      1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  LIPASE/CN
L75     82 SEA ADDY J?/AU,AUTH
L76     2006 SEA DALY C?/AU,AUTH
L77     57048 SEA BROWN J?/AU,AUTH
L78      0 SEA L75 AND L76 AND L77
L79     78233 SEA WAX OR WAXY? OR WAXI? OR WAXE? OR (WAX OR WAXY? OR WAXI?
OR WAXE?) (3A) ESTER? OR (OIL OR WAX OR WAXY? OR WAXI? OR
WAXE?) (3A) (JOJOBA OR HYDROGEN?(2A) JOJOBA? OR (SIMMODSIA OR
S) (W) CHINENSIS)
L80     114 SEA (L2 OR L4)
L81     26346 SEA ?TRANSESTERIF?

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L82 349505 SEA ?LIPASE?
 L83 62772 SEA L6
 L85 29286 SEA L82 (S) ?CATALY?
 L96 46 SEA (L75 OR L76 OR L77 OR L78) AND (L79 OR L80)
 L97 4 SEA (L75 OR L76 OR L77 OR L78) AND L81
 L98 318 SEA (L75 OR L76 OR L77 OR L78) AND (L82 OR L83 OR L85)
 L99 0 SEA L96 AND L97 AND L98
 L100 0 SEA L97 AND (L96 OR L98)
 L101 0 SEA L96 AND L98
 L102 4 SEA (L78 OR L97 OR L99 OR L100 OR L101)

=> dup rem L49 L74 L102

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 PROCESSING COMPLETED FOR L49
 PROCESSING COMPLETED FOR L74
 PROCESSING COMPLETED FOR L102

L103 5 DUP REM L49 L74 L102 (4 DUPLICATES REMOVED)
 ANSWERS '1-3' FROM FILE HCAPLUS
 ANSWER '4' FROM FILE MEDLINE
 ANSWER '5' FROM FILE BIOSIS

Inventor Search Results

=> d 1-3 ibib ab hitind; d 4-5 iall; file home

L103 ANSWER 1 OF 5 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 1
 ACCESSION NUMBER: 2016:1034778 HCAPLUS Full-text
 DOCUMENT NUMBER: 165:99506
 TITLE: Processes and systems for lipase catalyzed
 manufacture of wax ester derivatives
 INVENTOR(S): Addy, Jeff; Brown, James H.
 PATENT ASSIGNEE(S): International Flora Technologies, Ltd., USA
 SOURCE: U.S. Pat. Appl. Publ., 16pp., Cont.-in-part of U.S.
 Ser. No. 578,075.
 CODEN: USXXCO
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 3
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20160177350	A1	20160623	US 2015-14841242	20150831
US 20160177349	A1	20160623	US 2014-14578075	20141219
PRIORITY APPLN. INFO.:			US 2014-14578075	A2 20141219

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Processes for transesterifying wax esters. Implementations may include providing a feedstock including wax esters, introducing into the feedstock an alc. with a carbon number ranging from 1 to 34 carbons where the alc. is selected from the group consisting of a straight chain alc., a branched chain alc., any combination of straight chain alcs., any combination of branched chain alcs., and any combination thereof. The process may include contacting the feedstock with a lipase, and catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. The enzymically transesterified product may be adapted to produce a finished product having a certain formula that has a viscosity that substantially matches a viscosity of a finished product having the same certain formula including chemical catalyzed transesterified wax esters.

IPCI C12P0007-64 [I]

IPCR C12P0007-64 [I]

CC 16-2 (Fermentation and Bioindustrial Chemistry)

Section cross-reference(s): 60

ST lipase wax ester deriv

IT Alcohols

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(C1-34; processes and systems for lipase catalyzed
 manufacture of wax ester derivs.)

IT Hydrogenated vegetable oils

RL: BCP (Biochemical process); IMF (Industrial manufacture); RCT

(Reactant); BIOL (Biological study); PREP (Preparation); PROC (Process);

RACT (Reactant or reagent)

(Jojoba; processes and systems for lipase
 catalyzed manufacture of wax ester derivs.)

IT Alcohols

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(branched; processes and systems for lipase catalyzed
 manufacture of wax ester derivs.)

IT Antiaging cosmetics

Antioxidants

Cosmetic creams
 Cosmetic liquids
 Transesterification
 Viscosity
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)

- IT Waxes
 RL: BCP (Biochemical process); BPN (Biosynthetic preparation); RCT
 (Reactant); BIOL (Biological study); PREP (Preparation); PROC (Process);
 RACT (Reactant or reagent)
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)
- IT Aliphatic alcohols
 Jojoba oil
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)
- IT Tocopherols
 RL: BSU (Biological study, unclassified); BIOL (Biological study)
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)
- IT Alcohols
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (unsaturated; processes and systems for lipase
 catalyzed manufacture of wax ester derivs.)
- IT 9001-62-1, Lipase 287970-25-6, Lipozyme TL
 IM
 RL: BCP (Biochemical process); CAT (Catalyst use); BIOL
 (Biological study); PROC (Process); USES (Uses)
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)
- IT 112-30-1, 1-Decanol 143-28-2 661-19-8, 1-Docosanol
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (processes and systems for lipase catalyzed manufacture
 of wax ester derivs.)

L103 ANSWER 2 OF 5 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 2

ACCESSION NUMBER: 2016:1034777 HCAPLUS Full-text

DOCUMENT NUMBER: 165:107380

TITLE: Processes and systems for catalytic manufacture of
 wax ester derivatives

INVENTOR(S): Addy, Jeff; Daly, Clay; Brown, James H.

PATENT ASSIGNEE(S): International Flora Technologies, Ltd., USA

SOURCE: U.S. Pat. Appl. Publ., 16pp.; Chemical Indexing
 Equivalent to 165:107374 (WO)

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 3

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20160177349	A1	20160623	US 2014-14578075	20141219
US 20160177350	A1	20160623	US 2015-14841242	20150831
WO 2016100957	A1	20160623	WO 2015-US66953	20151219

W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW

RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM

PRIORITY APPLN. INFO.: US 2014-14578075 A2 20141219

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Processes for transesterifying wax esters are discussed. Implementations may include: providing a feedstock including wax esters, contacting the feedstock with a lipase, and catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. An oxidative stability index (OSI) of the transesterified product may be greater than an OSI of the feedstock.

IPCI C12P0007-64 [I]

IPCR C12P0007-64 [I]

CC 62-4 (Essential Oils and Cosmetics)

ST catalytic manuf wax ester cosmetic

IT Jojoba oil

RL: COS (Cosmetic use); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)

(hydrogenated; processes and systems for catalytic manufacture of wax ester derivs.)

IT Cosmetics and Personal care products

Stability

Transesterification

(processes and systems for catalytic manufacture of wax ester derivs.)

IT Jojoba oil

Waxes

RL: COS (Cosmetic use); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)

(processes and systems for catalytic manufacture of wax ester derivs.)

IT 9001-62-1, Lipase 287970-25-6, Lipozyme TL

IM

RL: CAT (Catalyst use); USES (Uses)

(processes and systems for catalytic manufacture of wax ester derivs.)

L103 ANSWER 3 OF 5 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 2016:1033048 HCAPLUS Full-text

DOCUMENT NUMBER: 165:107374

TITLE: Processes and systems for catalytic manufacture of wax ester derivatives

INVENTOR(S): Addy, Jeff; Daly, Clay; Brown, James H.

PATENT ASSIGNEE(S): International Flora Technologies, Ltd., USA

SOURCE: PCT Int. Appl., 37pp.; Chemical Indexing Equivalent to 165:107380 (US)

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 3

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2016100957	A1	20160623	WO 2015-US66953	20151219
W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM				
US 20160177349	A1	20160623	US 2014-14578075	20141219
PRIORITY APPLN. INFO.:			US 2014-14578075	A 20141219

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Processes for transesterifying wax esters are discussed. Implementations may include: providing a feedstock including wax esters, contacting the feedstock with a lipase, and catalytically transesterifying the wax esters in the feedstock with the lipase to form a transesterified product. An oxidative stability index (OSI) of the transesterified product may be greater than an OSI of the feedstock.

IPCI A61K0008-00 [I]; C12N0009-10 [I]; C12P0007-64 [I]

IPCR A61K0008-00 [I]; C12N0009-10 [I]; C12P0007-64 [I]

CC 62-4 (Essential Oils and Cosmetics)

ST catalytic manuf wax ester cosmetic

IT Jojoba oil

RL: COS (Cosmetic use); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)

(hydrogenated; processes and systems for catalytic manufacture of wax ester derivs.)

IT Cosmetics and Personal care products

Stability

Transesterification

(processes and systems for catalytic manufacture of wax ester derivs.)

IT Jojoba oil

Waxes

RL: COS (Cosmetic use); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)

(processes and systems for catalytic manufacture of wax ester derivs.)

IT 9001-62-1, Lipase 287970-25-6, Lipozyme TL

Im

RL: CAT (Catalyst use); USES (Uses)

(processes and systems for catalytic manufacture of wax ester derivs.)

REFERENCE COUNT:

5

THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L103 ANSWER 4 OF 5

MEDLINE ® on STN

DUPLICATE 3

ACCESSION NUMBER: 2012478496

MEDLINE Full-text

DOCUMENT NUMBER: PubMed ID: 22430941
 TITLE: Automated high-throughput fatty acid analysis of umbilical cord serum and application to an epidemiological study.
 AUTHORS IN PUB ORD: Lin Yu Hong; Salem Norman Jr; Wells Ellen M; Zhou Weiyin; Loewke James D; Brown James A; Lands William E M; Goldman Lynn R; Hibbeln Joseph R
 AUTHOR: Lin Yu Hong
 CORPORATE SOURCE: Section of Nutritional Neuroscience, Laboratory of Membrane Biochemistry and Biophysics, National Institute on Alcohol Abuse and Alcoholism, NIH, 5625 Fishers Lane, Room 3N-07, MSC 9410, Bethesda, MD 20892-9410, USA. yulin@mail.nih.gov
 AUTHOR: Salem Norman Jr; Wells Ellen M; Zhou Weiyin; Loewke James D; Brown James A; Lands William E M; Goldman Lynn R; Hibbeln Joseph R
 SOURCE: Lipids, (2012 May) Vol. 47, No. 5, pp. 527-39. Electronic Publication Date: 21 Mar 2012
 Journal code: 0060450. E-ISSN: 1558-9307. L-ISSN: 0024-4201.
 Report No.: NLM-NIHMS406344; NLM-PMC3475606.
 DIGITAL OBJECT ID: <http://dx.doi.org/10.1007/s11745-012-3661-6>
 PUB. COUNTRY: Germany: Germany, Federal Republic of
 DOCUMENT TYPE: Journal; Article; (JOURNAL ARTICLE)
 (RESEARCH SUPPORT, N.I.H., INTRAMURAL)
 LANGUAGE: English
 FILE SEGMENT: MEDLINE; Priority Journals
 FILE SEGMENT: Print; Electronic
 ENTRY MONTH: 201210
 ENTRY DATE: Entered STN: 21 Mar 2012
 Last Updated on STN: 30 Oct 2012
 Entered Medline: 29 Oct 2012

ABSTRACT:
 Large population studies show that polyunsaturated fatty acids are important for human health, but determining relationships between the health benefits and the fatty acid content has been hampered by the unavailability of labor-effective high-throughput technologies. An automated high throughput fatty acid analysis was developed from a previous procedure based on direct transesterification including the automation of chemical procedures, data acquisition and automatic data processing. The method was validated and applied to umbilical cord serum samples in an epidemiological study. The method was linear in the range of 1-600 µg/mL serum with $r^2 \geq 0.99$. The within-run CV was <5.4% for 23 fatty acids and a range of recoveries over three concentrations were 76-119% in a low-lipid matrix with the exception of 14:0. The fatty acid concentration as measured by the robotic method for human plasma was in good agreement with the Lepage & Roy method. The fatty acid profile in umbilical cord serum from American subjects (n = 287) showed an average of 38.0, 24.9, 32.0 and 4.6% of total fatty acids for saturates, monounsaturates, n-6 and n-3 polyunsaturates, respectively. This is the first report of a complete, validated, cost-effective, automated, high throughput fatty acid measurement method along with application to a population-based study. Automated fatty acid analysis coupled with automated data processing greatly facilitates the high throughput, 72 samples transesterified in 6 h, required for large population-based studies.

CONTROLLED TERM: Automation
 *Epidemiologic Research Design
 *Fatty Acids: BL, blood
 *Fetal Blood: CH, chemistry
 *High-Throughput Screening Assays: MT, methods
 Humans
 Quality Control

CHEMICAL NAME: Fatty Acids
 GRANT FUNDING ORG.: United States Intramural NIH HHS
 GRANT FUNDING NUM.: ZIA AA000262-28
 OS.CITING REF COUNT: 7 There are 7 MEDLINE records that cite this record
 DATE LAST CITED: Date last citing reference entered STN: 19 Mar 2016
 OS.CITING.REFS: MEDLINE 2015973268; 2015694773; 2014891609; 2014868498;
 2014820840; 2013685990; 2013004495
 MEDLINE REFERENCE COUNT: 31 There are 31 cited references available in
 MEDLINE for this document.

REFERENCE(S): CITED REFERENCES AVAILABLE IN MEDLINE FILE

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L103 ANSWER 5 OF 5 BIOSIS COPYRIGHT (c) 2016 The Thomson Corporation on STN
 ACCESSION NUMBER: 2010:388378 BIOSIS Full-text
 DOCUMENT NUMBER: PREV201000388378
 TITLE: CHED 799-Comparison of oil feedstocks for biodiesel (B100)
 production: Processing parameters and fuel properties.
 AUTHOR(S): Sampson, Micah [Reprint Author]; Dodds, Justin; Brown,
 Joshua; Lemus, Ricardo; Stephens, Jimmy; Workman, Ron;
 Dabdoub, Miguel J.; Paiva, Nancy L.
 CORPORATE SOURCE: SE Oklahoma State Univ, Dept Chem Comp and Phys Sci,
 Durant, OK 74701 USA
 npaiva@sosu.edu; migjodab@usp.br; nlpaiva@alum.mit.edu
 SOURCE: Abstracts of Papers American Chemical Society, (APR 6 2008)

14/578,075

Vol. 235, pp. 799-CHED.

Meeting Info.: 235th American-Chemical-Society National Meeting. New Orleans, LA, USA. April 06 -10, 2008. Amer Chem Soc.

CODEN: ACSRAL. ISSN: 0065-7727.

DOCUMENT TYPE:

Conference; (Meeting)

Conference; (Meeting Poster)

LANGUAGE:

English

ENTRY DATE:

Entered STN: 7 Jul 2010

Last Updated on STN: 7 Jul 2010

CONCEPT CODE:

General biology - Symposia, transactions and proceedings
00520

Biochemistry studies - General 10060

INDEX TERMS:

Major Concepts

Biochemistry and Molecular Biophysics

INDEX TERMS:

Chemicals & Biochemicals

triacylglyceride; sunflower oil; corn oil; fatty acid

methyl ester; peanut oil; canola oil; safflower oil;

palm kernel oil; soy oil; petrodiesel; B100 biodiesel

INDEX TERMS:

Miscellaneous Descriptors

transesterification process; fuel property

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FILE COVERS 1907 - 20 Sep 2016 VOL 165 ISS 14

FILE LAST UPDATED: 19 Sep 2016 (20160919/ED)

REVISED CLASS FIELDS (/NCL) LAST RELOADED: Dec 2015

USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Dec 2015

HCAplus includes complete International Patent Classification (IPC) reclassification data for the third quarter of 2016.

HCAplus now includes the comprehensive Cooperative Patent Classification (CPC). See HELP CPC for details.

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<http://www.cas.org/legal/infopolicy>

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d que L39

L2	1	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	WAX ESTERS/CN
L3	0	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	8063-08-9/CRN
L4	1	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	JOJOBA WAX/CN
L5	0	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	61789-91-1/CRN
L6	1	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	LIPASE/CN
L7	4	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	9001-62-1/CRN
L8	9817	SEA FILE=REGISTRY	SPE=ON	ABB=ON	PLU=ON	LIPASE/CNS
L9	102744	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	WAXES+OLD,NT/CT
L10	4867	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	JOJOBA OIL+OLD/CT
L11	190515	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	WAX OR WAXY? OR WAXI? OR WAXE? OR (WAX OR WAXY? OR WAXI? OR WAXE?)(3A)ESTER? OR (OIL OR WAX OR WAXY? OR WAXI? OR WAXE?)(3A)(JOJOBA OR HYDROGEN?(2A)J OJOBA? OR (SIMMODSIA OR S)(W)CHINENSIS)
L12	20696	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	TRANSESTERIFICATION+NT /CT
L13	7714	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	TRANSESTERIFICATION CATALYSTS+NT/CT
L14	23	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	TRANSESTERIFICATION ENTHALPY+OLD/CT
L15	927	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	TRANSESTERIFICATION KINETICS+OLD/CT

L16	42460	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	?TRANSESTERIF?
L17	61050	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	TRIACYLGLYCEROL LIPASE+NT/CT
L18	150908	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	?LIPASE?
L19	52	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L2 OR L3 OR L4 OR L5 OR L9 OR L10 OR L11) AND (L12 OR L13 OR L14 OR L15 OR L16) AND (L6 OR L7 OR L8 OR L17 OR L18)
L20	16221	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L6 OR L7 OR L8 OR L17) (L) CAT/RL
L21	7409	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L6 OR L7 OR L8 OR L17) (L) ?CATALY?
L22	428	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L13 (L) L18
L23	17284	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L18 (S) ?CATALY?
L24	37	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L19 AND (L20 OR L21 OR L22 OR L23)
L25	42	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L2 OR L3 OR L4 OR L5 OR L9 OR L10) (L) L16
L26	50	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L12 OR L13 OR L14 OR L15) (L) L11
L27	156	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L11 (S) L16
L28	19	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L19 AND (L25 OR L26 OR L27)
L29	1522	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L6 OR L7 OR L8 OR L17) (L) L16
L30	2658	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L12 OR L13 OR L14 OR L15) (L) L18
L31	4457	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L16 (S) L18
L32	28	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L19 AND (L29 OR L30 OR L31)
L33	141	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L2 OR L3 OR L4 OR L5 OR L9 OR L10) (L) L18
L34	106	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L6 OR L7 OR L8 OR L17) (L) L11
L35	254	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L11 (S) L18
L36	32	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L19 AND (L33 OR L34 OR L35)
L37	19	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L28 AND (L24 OR L32 OR L36)
L38	17	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	L24 AND L32 AND L36
L39	27	SEA FILE=HCAPLUS	SPE=ON	ABB=ON	PLU=ON	(L37 OR L38)

=> s L39 not L49

L104 24 L39 NOT L49

(L49-- Previously Displayed)

=> file wpix

FILE 'WPIX' ENTERED AT 10:57:36 ON 20 SEP 2016

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FILE LAST UPDATED: 15 SEP 2016 <20160915/UP>

MOST RECENT UPDATE: 201660 <201660/DW>

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'BI ABEX BIEX' IS DEFAULT SEARCH FIELD FOR 'WPIX' FILE

=> d que L68

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L54      150717 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  WAX/BI,ABEX,BIEX OR
          WAXY?/BI,ABEX,BIEX OR WAXI?/BI,ABEX,BIEX OR WAXE?/BI,ABEX,BIEX
          OR (WAX/BI,ABEX,BIEX OR WAXY?/BI,ABEX,BIEX OR WAXI?/BI,ABEX,BI
          X OR WAXE?/BI,ABEX,BIEX) (3A)ESTER?/BI,ABEX,BIEX OR (OIL/BI,ABEX
          ,BIEX OR WAX/BI,ABEX,BIEX OR WAXY?/BI,ABEX,BIEX OR WAXI?/BI,ABE
          X,BIEX OR WAXE?/BI,ABEX,BIEX) (3A) (JOJOBA/BI,ABEX,BIEX OR
          HYDROGEN?/BI,ABEX,BIEX (2A)JOJOBA?/BI,ABEX,BIEX OR (SIMMODSIA/BI
          ,ABEX,BIEX OR S/BI,ABEX,BIEX) (W)CHINENSIS/BI,ABEX,BIEX)
L55      11281 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  ?TRANSESTERIF?/BI,ABEX,BI
          EX
L56      20648 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  ?LIPASE?/BI,ABEX,BIEX
L57      29 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L54 AND L55 AND L56
L58      2511 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L56 (S) ?CATALY?/BI,ABEX,
          BIEX
L59      9 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L57 AND L58
L60      194 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L54 (S) L55
L61      20 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L57 AND L60
L62      596 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L55 (S) L56
L63      23 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L57 AND L62
L64      250 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L54 (S) L56
L65      17 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L57 AND L64
L66      9 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L59 AND (L61 OR L63 OR
          L65)
L67      14 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  L61 AND L63 AND L65
L68      16 SEA FILE=WPIX SPE=ON  ABB=ON  PLU=ON  (L66 OR L67)
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=> s L68 not L74

L105 14 L68 NOT L74 (L74-- Previously Displayed)

=> file medline biosis ceaba compendex inspec insphys embase
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=> d que L95

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L2          1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  WAX ESTERS/CN
L4          1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  JOJOBA WAX/CN
L6          1 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  LIPASE/CN
L79         78233 SEA WAX OR WAXY? OR WAXI? OR WAXE? OR (WAX OR WAXY? OR WAXI?
              OR WAXE?) (3A) ESTER? OR (OIL OR WAX OR WAXY? OR WAXI? OR
              WAXE?) (3A) (JOJOBA OR HYDROGEN? (2A) JOJOBA? OR (SIMMODSIA OR
              S) (W) CHINENSIS)
L80         114 SEA (L2 OR L4)
L81         26346 SEA ?TRANSESTERIF?
L82         349505 SEA ?LIPASE?
L83         62772 SEA L6
L84          32 SEA (L79 OR L80) AND L81 AND (L82 OR L83)
L85         29286 SEA L82 (S) ?CATALY?
L86          14 SEA L84 AND L85
L87         113 SEA L79 (S) L81
L88          22 SEA L84 AND L87
L89         4399 SEA L81 (S) L82
L90          22 SEA L84 AND L89
L91         262 SEA L79 (S) L82
L92          25 SEA L84 AND L91
L93          13 SEA L86 AND (L88 OR L90 OR L92)
L94          17 SEA L88 AND L90 AND L92
L95          24 SEA (L93 OR L94)

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=> s L95 not L102

L106 24 L95 NOT L102 (L102-- Previously Displayed)

=> dup rem L104 L105 L106

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PROCESSING COMPLETED FOR L104
PROCESSING COMPLETED FOR L105
PROCESSING COMPLETED FOR L106
L107 46 DUP REM L104 L105 L106 (16 DUPLICATES REMOVED)
 ANSWERS '1-24' FROM FILE HCAPLUS
 ANSWERS '25-36' FROM FILE WPIX
 ANSWERS '37-38' FROM FILE BIOSIS
 ANSWERS '39-40' FROM FILE CEABA-VTB
 ANSWERS '41-45' FROM FILE COMPENDEX
 ANSWER '46' FROM FILE EMBASE

Text Search Results

=> d 1-24 ibib ab hitind; d 25-36 ibib ab; d 37-46 iall; file home

L107 ANSWER 1 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 1

ACCESSION NUMBER: 2016:79683 HCAPLUS Full-text

TITLE: Synthesis of jatropha oil based wax esters using an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme RM IM

AUTHOR(S): Ungcharoenwiwat, Pakpimol; Canyuk, Bhutorn; H-Kittikun, Aran

CORPORATE SOURCE: Department of Industrial Biotechnology, Faculty of Agro-Industry, Prince of Songkla University, Hat Yai, 90112, Thailand

SOURCE: Process Biochemistry (Oxford, United Kingdom) (2016), 51(3), 392-398

CODEN: PBCHE5; ISSN: 1359-5113

DIGITAL OBJECT ID: 10.1016/j.procbio.2015.12.019

PUBLISHER: Elsevier Ltd.

DOCUMENT TYPE: Journal; (online computer file)

LANGUAGE: English

AB A comparison of the synthesis of wax esters by transesterification of jatropha oil and oleyl alc. using the immobilized lipase EQ3 (Burkholderia sp. EQ3) and Lipozyme RM IM (Rhizomucor miehei) was carried out. The predominant fatty acids in jatropha oil were palmitic acid (14%), stearic acid (7%), oleic acid (41%) and linoleic acid (35%). The optimum conditions for the synthesis of wax esters by the immobilized lipase EQ3 were 10 U of enzyme, a molar ratio of jatropha oil and oleyl alc. of 1:4 in isooctane at 30 for 12 h to achieve an 89% conversion. The optimum conditions for wax ester synthesis by the Lipozyme RM IM were 10 U of enzyme, a molar ratio of jatropha oil and oleyl alc. of 1:3 in hexane at 45 for 12 h to achieve an 86% conversion. For the reusability test, the immobilized lipase EQ3 provided a higher percentage of wax esters (88%) than the Lipozyme RM IM (24%) at the 5th batch. The wax ester composition of the jatropha oil was oleyl palmitate (18%), oleyl stearate (10%), oleyl oleate and oleyl linoleate (67%). The wax esters had m.ps. of -14.83, 8.50 and 13.17, and were completely decomposed at 380.

CC 16-5 (Fermentation and Bioindustrial Chemistry)

ST jatropha oil wax ester immobilized lipase Burkholderia Lipozyme

IT INDEXING IN PROGRESS

IT Burkholderia

Jatropha curcas

Rhizomucor miehei

Transesterification

(synthesis of jatropha oil based wax esters using an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme RM IM)

IT Waxes

RL: BCP (Biochemical process); BIOL (Biological study); PROC (Process)

(synthesis of jatropha oil based wax esters using an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme RM IM)

IT Fatty acids

RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)

(synthesis of jatropha oil based wax esters using an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme RM IM)

IT 110-54-3, Hexane 540-84-1, Isooctane

RL: BCP (Biochemical process); BIOL (Biological study); PROC (Process)

(synthesis of jatropha oil based wax esters using
an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme
RM IM)

IT 57-10-3P, Palmitic acid 57-11-4P, Stearic acid 60-33-3P, Linoleic acid
112-80-1P, Oleic acid 143-28-2P, Oleyl alcohol 463-40-1P, Linolenic
acid 506-30-9P, Arachidic acid 544-63-8P, Myristic acid 557-59-5P,
Lignoceric acid 2906-55-0P, Oleyl palmitate 3687-45-4P,
Oleyl oleate 17673-50-6P, Oleyl stearate 17673-59-5P, Oleyl linoleate
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP
(Preparation)

(synthesis of jatropha oil based wax esters using
an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme
RM IM)

IT 9001-62-1, Lipase 287970-25-6, Lipozyme RM
IM
RL: BSU (Biological study, unclassified); CAT (Catalyst use);
BIOL (Biological study); USES (Uses)
(synthesis of jatropha oil based wax esters using
an immobilized lipase from Burkholderia sp. EQ3 and Lipozyme
RM IM)

REFERENCE COUNT: 53 THERE ARE 53 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 2 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 2

ACCESSION NUMBER: 2016:9621 HCAPLUS Full-text

DOCUMENT NUMBER: 164:289265

TITLE: Lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Analysis of Seed Lipids

AUTHOR(S): Kim, Chang-Su; Lim, Do-Hyung; Keum, Young Soo

CORPORATE SOURCE: Department of Bioresources and Food Science, College
of Life and Environmental Sciences, Konkuk University,
Seoul, S. Korea

SOURCE: Journal of the American Oil Chemists' Society (2016),
93(3), 339-346

CODEN: JAOCA7; ISSN: 0003-021X

DIGITAL OBJECT ID: 10.1007/s11746-015-2783-4

PUBLISHER: Springer

DOCUMENT TYPE: Journal; (online computer file)

LANGUAGE: English

AB Numerous derivs. of fatty acids (FA), including esters of methanol/3-
hydroxymethylpyridine or dimethyloxazoline, are used for the anal. of FAs in
biol. specimens. Picolinyl derivs. are frequently prepared for structural
determination by gas chromatog.-mass spectrometry (GC-MS) since they provide
characteristic fragments. The ester can be prepared by chemical methods-
multistep methodologies or basic transesterification. Microbial lipases
catalyze a number of transesterification reactions, and their catalytic
activities are often stable at extreme conditions. Although these
characteristic features may be useful in the application of typical FA
structure anal. by picolinyl ester, detailed studies have not been reported.
To address the problems, a simple and quant. methodol. for the synthesis of
picolinyl esters from lipids has been developed. It involves the
transesterification with Novozym 435 (Novozymes Biopharma US Inc.,
Franklinton, USA), resin-immobilized lipase from Candida antarctica in toluene.
Mild reaction conditions allow for complete derivatization of perilla seed oil
in 30 min at 50 °C. The procedure was further studied with various TAGs and
fatty wax from 17 plants. The optimized procedure was as follows; 1 mg lipid
and 20 mg catalyst in 2 mL toluene at 50 °C for 1 h. Quant. anal. of marker
FAs was performed with the proposed method. The results coincided well with
those from potassium t-butoxide-catalyzed reaction. The optimized method,

however, was not applicable for the determination of some epoxy FAs, fatty wax, and parinaric acid.

CC 17-1 (Food and Feed Chemistry)

IT Food analysis
Gas chromatography-mass spectrometry
Oilseed
Pseudozyma antarctica
Seed
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Fatty acids
RL: ANT (Analyte); ANST (Analytical study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Epoxy fatty acids
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Esters
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Fas antigen
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Lipids
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT Waxes
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

IT 7440-09-7, Potassium, biological studies 18427-44-6, Parinaric acid
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(lipase-Catalyzed Synthesis of Fatty Acid
Pyridylcarbinol Ester for the Anal. of Seed Lipids)

REFERENCE COUNT: 28 THERE ARE 28 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 3 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 4

ACCESSION NUMBER: 2014:1090066 HCAPLUS Full-text

DOCUMENT NUMBER: 161:154108

TITLE: Enzymatic transesterification/esterification
processing systems and processes employing lipases
immobilized on hydrophobic resins

INVENTOR(S): Basheer, Sobhi; Mohsen, Usama

PATENT ASSIGNEE(S): Trans Bio-Diesel Ltd., Israel

SOURCE: PCT Int. Appl., 67pp.
CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014102796	A1	20140703	WO 2013-IL51079	20131230
W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,				

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW

RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM

CA	2896428	A1	20140703	CA	2013-2896428	20131230
US	20140186908	A1	20140703	US	2013-14143258	20131230
AU	2013368822	A1	20150709	AU	2013-368822	20131230
IL	239404	A	20150730	IL	2013-239404	20131230
CN	104884630	A	20150902	CN	2013-80068947	20131230
KR	2015102034	A	20150904	KR	2015-7017754	20131230
EP	2938739	A1	20151104	EP	2013-868472	20131230

R: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LI, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BA, ME

JP	2016503652	T	20160208	JP	2015-550208	20131230
AR	94350	A1	20150729	AR	2014-100014	20140103
MX	2015008523	A	20150910	MX	2015-8523	20150626
US	20150353970	A1	20151210	US	2015-14758336	20150629
IN	2015MN01710	A	20160527	IN	2015-MN1710	20150629

PRIORITY APPLN. INFO.: US 2012-61747618 P 20121231
WO 2013-IL51079 W 20131230

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Disclosed are processing systems and processes for carrying out enzymic batchwise or continuous process for the production of fatty acid alkyl esters for use in the biofuels, food, cosmetics, pharmaceuticals and detergents industries.

IPCI C12P0007-64 [I]; B01J0008-02 [I]; B01J0008-24 [I]

IPCR C12P0007-64 [I]; B01J0008-02 [I]; B01J0008-24 [I]

CC 16-5 (Fermentation and Bioindustrial Chemistry)

ST immobilized lipase processing system transesterification

IT Alcohols

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)

(C1-6; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)

IT Fatty alcohols

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)

(C6-22; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)

IT Fatty acids

RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)

(Me esters; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)

IT Biodiesel fuel

Buffers

Centrifuges

Enzymic esterification
 Fluidized-bed bioreactors
 Grease (animal fat)

Transesterification

Unit operations

Waste oils

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Polyhydric alcohols

RL: BCP (Biochemical process); BIOL (Biological study); PROC (Process)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Immobilized enzymes

RL: BCP (Biochemical process); CAT (Catalyst use); BIOL (Biological
 study); PROC (Process); USES (Uses)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Animal fats

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Carbonates

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Diglycerides

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Esters

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Fats and Glyceridic oils

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Fatty acids

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing
 systems and processes employing lipases immobilized on
 hydrophobic resins)

IT Fish oil

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);

PROC (Process); RACT (Reactant or reagent)

- (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Monoglycerides
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Phospholipids
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Soybean oil
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Triglycerides
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Vegetable oils
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Waxes
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Fatty acids
 RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
 (esters; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Glycerides
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (partial; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Separators
 (settlers; enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)
- IT Fats and Glyceridic oils
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (single-cell; enzymic transesterification/esterification

processing systems and processes employing lipases immobilized on hydrophobic resins)

IT 8049-47-6, Pancreatin 9001-62-1, Lipase 1435939-45-9, Lipase B

RL: BCP (Biochemical process); CAT (Catalyst use); BIOL (Biological study); PROC (Process); USES (Uses)

(enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)

IT 64-17-5, Ethanol, reactions 67-56-1, Methanol, reactions 79-20-9, Methyl acetate 616-38-6, Dimethyl carbonate

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)

(enzymic transesterification/esterification processing systems and processes employing lipases immobilized on hydrophobic resins)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 4 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 5

ACCESSION NUMBER: 2012:1443007 HCAPLUS Full-text

DOCUMENT NUMBER: 157:546471

TITLE: Lipase catalyzed transesterification of glyceridic oils for biodiesel production

INVENTOR(S): Nielsen, Per Munk; Holm, Hans Christian

PATENT ASSIGNEE(S): Novozymes A/S, Den.

SOURCE: PCT Int. Appl., 18pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012130961	A1	20121004	WO 2012-EP55668	20120329
W:	AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW			
RW:	AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
CN 103459607	A	20131218	CN 2012-80016597	20120329
EP 2691532	A1	20140205	EP 2012-717625	20120329
R:	AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LI, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR			
US 20140017741	A1	20140116	US 2013-14004609	20131001
IN 2013CN08440	A	20141107	IN 2013-CN8440	20131021
PRIORITY APPLN. INFO.:			EP 2011-160478	A 20110330
			EP 2011-161192	A 20110405
			WO 2012-EP55668	W 20120329

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention relates to the utilization of fatty acid feedstock in the production of biodiesel by the use of microbial enzymes.

IPCI C12P0007-64 [I]

IPCR C12P0007-64 [I]

CC 16-5 (Fermentation and Bioindustrial Chemistry)
Section cross-reference(s): 52

ST lipase transesterification glyceridic oil biodiesel sequence

IT Fatty acids
RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
(Et esters; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Fats and Glyceridic oils
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
(Limnanthes alba seed; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Fatty acids
RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
(Me esters; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Fatty acids
RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
(esters; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Gene, microbial
RL: BSU (Biological study, unclassified); PRP (Properties); BIOL (Biological study)
(for 1,3-specific triacylglycerol lipase; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT *Kosteletzkya virginica*
Thlaspi
(glyceridic oil from; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Fats and Glyceridic oils
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
(haplophyte; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Gene, microbial
RL: BSU (Biological study, unclassified); PRP (Properties); BIOL (Biological study)
(lipB; lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Distillation
Evaporation
Flash distillation
Phase separation
Protein immobilization
Protein sequences
Pseudozyma antarctica
Thermomyces lanuginosus
Transesterification
(lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT Alcohols

Canola oil
 Castor oil
 Coconut oil
 Coriander seed glyceridic oil
 Corn oil
 Cottonseed oil
 Fish oil
 Glycerides
 Grape seed oil
 Hemp oil
 Jojoba oil
 Linseed oil
 Mustard oil
 Palm kernel oil
 Palm oil
 Peanut oil
 Rape oil
 Rice bran oil
 Safflower oil
 Soybean oil
 Sunflower oil
 Tall oil
 Teaseed oil

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (lipase catlyzed transesterification of glyceridic
 oils for biodiesel production)

IT Jatropha curcas
 (oil; lipase catlyzed transesterification of
 glyceridic oils for biodiesel production)

IT Palm oil
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (oleins; lipase catlyzed transesterification of
 glyceridic oils for biodiesel production)

IT Fats and Glyceridic oils
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (single-cell; lipase catlyzed transesterification
 of glyceridic oils for biodiesel production)

IT Palm oil
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (stearins; lipase catlyzed transesterification of
 glyceridic oils for biodiesel production)

IT 7440-44-0, Activated carbon, biological studies
 RL: BUU (Biological use, unclassified); TEM (Technical or engineered
 material use); BIOL (Biological study); USES (Uses)
 (activated; lipase catlyzed transesterification of
 glyceridic oils for biodiesel production)

IT 1401372-92-6 1401372-93-7
 RL: BSU (Biological study, unclassified); PRP (Properties); BIOL
 (Biological study)
 (amino acid sequence; lipase catlyzed
 transesterification of glyceridic oils for biodiesel production)

IT 9001-62-1, Lipase 287970-25-6, Lipozyme TL
 RL: BCP (Biochemical process); BSU (Biological study, unclassified);
 CAT (Catalyst use); PRP (Properties); BIOL (Biological study);
 PROC (Process); USES (Uses)

(lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT 56-81-5P, Glycerol, preparation
 RL: BCP (Biochemical process); BYP (Byproduct); BIOL (Biological study); PREP (Preparation); PROC (Process)
 (lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT 64-17-5, Ethanol, reactions 67-56-1, Methanol, reactions 71-23-8, 1-Propanol, reactions
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
 (lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT 1318-00-9, Vermiculite 1344-28-1, Alumina, biological studies 7631-86-9, Silica, biological studies 9002-88-4, Polyethylene 9003-07-0, Polypropylene 9003-53-6, Polystyrene 9004-34-6, Cellulose, biological studies 9012-36-6, Agarose 12304-65-3, Hydrotalcite 25087-26-7, Polymethacrylic acid
 RL: BUU (Biological use, unclassified); TEM (Technical or engineered material use); BIOL (Biological study); USES (Uses)
 (lipase catalyzed transesterification of glyceridic oils for biodiesel production)

IT 7732-18-5P, Water, preparation
 RL: BYP (Byproduct); REM (Removal or disposal); PREP (Preparation); PROC (Process)
 (lipase catalyzed transesterification of glyceridic oils for biodiesel production)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 5 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 6

ACCESSION NUMBER: 2011:801456 HCAPLUS Full-text

DOCUMENT NUMBER: 155:378054

TITLE: Immobilized *Rhizopus oryzae* lipase catalyzed synthesis of palm stearin and cetyl alcohol wax esters: optimization by response surface methodology

AUTHOR(S): Sellami, Mohamed; Aissa, Imen; Frikha, Fakher; Gargouri, Youssef; Miled, Nabil

CORPORATE SOURCE: Laboratoire de Biochimie et de Genie Enzymatique des Lipases, ENIS, Universite de Sfax, Sfax, Tunisia

SOURCE: BMC Biotechnology (2011), 11, 68
 CODEN: BBMIE6; ISSN: 1472-6750
 URL: <http://www.biomedcentral.com/content/pdf/1472-6750-11-68.pdf>

DIGITAL OBJECT ID: 10.1186/1472-6750-11-68

PUBLISHER: BioMed Central Ltd.

DOCUMENT TYPE: Journal; (online computer file)

LANGUAGE: English

AB Waxes are esters of long-chain fatty acids and long-chain alcs. Their principal natural sources are animals (sperm whale oil) and vegetables (jojoba) which are expensive and not easily available. Wax esters synthesized by enzymic transesterification, using palm stearin as raw material, can be considered as an alternative to natural ones. Palm stearin is a solid fraction obtained by fractionation of palm oil. Palm stearin was esterified with cetyl alc. to produce a mixture of wax esters. A non-com. immobilized lipase from *Rhizopus oryzae* was used as biocatalyst. Response surface methodol. was employed to determine the effects of the temperature (30-50 °C), the enzyme concentration (33.34-300 IU/mL), the alc./palm stearin molar ratio (3-7 mol/mol) and the substrate concentration (0.06-0.34 g/mL) on the

conversion yield of palm stearin. Under optimal conditions (temperature, 30°C; enzyme concentration, 300 IU/mL; molar ratio 3 and substrate concentration 0.21 g/mL) a high conversion yield of 98.52% was reached within a reaction time of 2 h. Response surface methodol. was successfully applied to determine the optimum operational conditions for synthesis of palm stearin based wax esters. This study may provide useful tools to develop economical and efficient processes for the synthesis of wax esters.

CC 16-8 (Fermentation and Bioindustrial Chemistry)
Section cross-reference(s): 7

ST Rhizopus lipase immobilization palm stearin wax ester optimization

IT HPLC

Rhizopus oryzae

Simulation and Modeling

TLC (thin layer chromatography)

Temperature effects, biological

(immobilized Rhizopus oryzae lipase catalyzed
synthesis of palm stearin and cetyl alc. wax esters
and optimization by response surface methodol.)

IT Waxes

RL: BSU (Biological study, unclassified); BIOL (Biological study)

(immobilized Rhizopus oryzae lipase catalyzed
synthesis of palm stearin and cetyl alc. wax esters
and optimization by response surface methodol.)

IT Palm oil

RL: BSU (Biological study, unclassified); BIOL (Biological study)

(stearins; immobilized Rhizopus oryzae lipase
catalyzed synthesis of palm stearin and cetyl alc. wax
esters and optimization by response surface methodol.)

IT 110-54-3, n-Hexane, biological studies 9001-62-1,

Lipase 36653-82-4, Cetyl alcohol

RL: BSU (Biological study, unclassified); BIOL (Biological study)

(immobilized Rhizopus oryzae lipase catalyzed
synthesis of palm stearin and cetyl alc. wax esters
and optimization by response surface methodol.)

OS.CITING REF COUNT: 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD
(8 CITINGS)

REFERENCE COUNT: 29 THERE ARE 29 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 6 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 7

ACCESSION NUMBER: 1997:644897 HCAPLUS Full-text

DOCUMENT NUMBER: 127:318298

ORIGINAL REFERENCE NO.: 127:62373a,62376a

TITLE: An original transesterification route for fatty acid
ester production from vegetable oils in a solvent-free
system

AUTHOR(S): Goma-Doncescu, N.; Legoy, M. D.

CORPORATE SOURCE: Laboratoire Genie Proteique et Cellulaire, Pole
Sciences et Technologie, La Rochelle, 17 042, Fr.

SOURCE: Journal of the American Oil Chemists' Society (1997),
74(9), 1137-1143

CODEN: JAOCA7; ISSN: 0003-021X

DIGITAL OBJECT ID: 10.1007/s11746-997-0037-9

PUBLISHER: AOCS Press

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Wax ester production from a long-chain alc. and Me ester has been investigated
with an immobilized thermostable lipase (lipozyme IM from Novo Nordisk). The
transesterification reaction rate was monitored in solvent-free medium that

was exclusively composed of the reactants and the enzyme. The transesterification is performed by simply mixing the 2 substrates in various stoichiometric amts. at a temperature range from 55 to 65°C under constant stirring in the presence of low concns. of enzyme preparation (0.12 to 2%, weight/weight). Long-chain reactants produce waxes of high mol. mass that induce low solubility and high viscosity. On average, high transesterification yields are obtained (around 95%). Thermodyn. parameters involving substrate concentration and temperature have also been investigated. The balance between optimal working temperature and the molar ratio of substrates in such a complex medium appears to be 60°C, with a molar ratio Me oleate/stearyl alc. of 1:0.5. Substrate inhibition due to stearyl alc. has been observed. A study of kinetic parameters has confirmed these results.

CC 17-9 (Food and Feed Chemistry)

ST fatty acid ester formation vegetable oil; transesterification fatty acid ester

IT Fatty acids

RL: BSU (Biological study, unclassified); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)

(esters; original transesterification route for fatty acid ester production from vegetable oils in a solvent-free system)

IT Transesterification

(original transesterification route for fatty acid ester production from vegetable oils in a solvent-free system)

IT Waxes

RL: BSU (Biological study, unclassified); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)

(original transesterification route for fatty acid ester production from vegetable oils in a solvent-free system)

IT Fats and Glyceridic oils

RL: FFD (Food or feed use); BIOL (Biological study); USES (Uses)

(vegetable; original transesterification route for fatty acid ester production from vegetable oils in a solvent-free system)

IT 112-62-9, Methyl oleate 112-92-5, Stearyl alcohol 17673-49-3

RL: BSU (Biological study, unclassified); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)

(original transesterification route for fatty acid ester production from vegetable oils in a solvent-free system)

OS.CITING REF COUNT: 20 THERE ARE 20 CAPLUS RECORDS THAT CITE THIS RECORD (20 CITINGS)

REFERENCE COUNT: 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 7 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN DUPLICATE 9

ACCESSION NUMBER: 1986:32969 HCAPLUS Full-text

DOCUMENT NUMBER: 104:32969

ORIGINAL REFERENCE NO.: 104:5409a,5412a

TITLE: Synthesis of esters by lipases

AUTHOR(S): Lazar, G.

CORPORATE SOURCE: Henkel K.-G.aA, Duesseldorf, 4000/1, Fed. Rep. Ger.

SOURCE: Fette, Seifen, Anstrichmittel (1985), 87(10), 394-400
CODEN: FSASAX; ISSN: 0015-038X

DOCUMENT TYPE: Journal

LANGUAGE: German

AB The com. or possible com. preparation of various types of esters by using lipase [9001-62-1] from microorganisms is discussed. The esterification of alcs. and terpene alcs.; the preparation of wax esters, glycerides, ester oligomers, and 2-methylpentanoic acid prenyl ester [94288-01-4]; and the use of transesterification with lipases to produce cocoa butter substitutes and fatty acid esters are topics included.

CC 16-1 (Fermentation and Bioindustrial Chemistry)
 Section cross-reference(s): 17

ST ester manuf lipase microorganism; lipid ester manuf lipase
 microorganism; cocoa butter substitute manuf lipase

IT Transesterification
 (by lipases, of microorganisms in ester manufacture)

IT Waxes and Waxy substances
 RL: BIOL (Biological study)
 (esters, manufacture of, with lipases of microorganisms)

IT Microorganism
 (lipases of, in ester manufacture)

IT Cocoa butter substitutes
 (manufacture of, with lipases of microorganisms)

IT Esters, preparation
 Fatty acids, esters
 Glycerides, preparation
 RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP
 (Preparation)
 (manufacture of, with lipases of microorganisms)

IT Esterification
 (of alcs. and terpene alcs., with lipases of microorganisms)

IT Terpenes and Terpenoids, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (alcs., esterification of, with lipases of microorganisms)

IT Esters, preparation
 RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP
 (Preparation)
 (di-, manufacture of, with lipases of microorganisms)

IT Alcohols, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (terpenoid, esterification of, with lipases of
 microorganisms)

IT 94288-01-4P
 RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP
 (Preparation)
 (manufacture of, with lipases of microorganisms)

IT 9001-62-1
 RL: BIOL (Biological study)
 (of microorganisms, in ester manufacture)

OS.CITING REF COUNT: 7 THERE ARE 7 CAPLUS RECORDS THAT CITE THIS RECORD
 (7 CITINGS)

L107 ANSWER 8 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 2015:1936852 HCAPLUS Full-text

DOCUMENT NUMBER: 164:21983

TITLE: Production of fatty acid alkyl esters with caustic and
 lipase

INVENTOR(S): Rancke-Madsen, Anders; Nielsen, Per Munk

PATENT ASSIGNEE(S): Novozymes A/S, Den.

SOURCE: PCT Int. Appl., 49pp.
 CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2015181308	A1	20151203	WO 2015-EP61872	20150528
W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,				

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW

RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM

PRIORITY APPLN. INFO.: EP 2014-170447 A 20140528
EP 2014-175592 A 20140703

AB A method for producing fatty acid alkyl esters, comprising providing a system comprising an oil phase/hydrophobic phase and a hydrophilic phase, and reacting a fatty acid feedstock present in said oil phase/hydrophobic phase with alc. in the presence of water and one or more lipolytic enzymes.

IPCI C12P0007-64 [I]

IPCR C12P0007-64 [I]

CC 16-5 (Fermentation and Bioindustrial Chemistry)

Section cross-reference(s): 45

ST caustic ~~lipase~~ fatty acid alkyl ester

IT Fatty acids

RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)

(Me esters; production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Binary systems

(aqueous two-phase; production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Fatty acids

RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)

(esters; production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Jatropha curcas

(oil; production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Palm oil

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)

(oleins; production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Enzymic esterification

Grease (animal fat)

Precipitation reaction

Transesterification

(production of fatty acid alkyl esters with caustic and ~~lipase~~)

IT Alcohols

Animal fats

Canola oil

Castor oil

Coconut oil

Corn oil

Cottonseed oil

Fats and Glyceridic oils

Fatty acids

Fish oil

Grape seed oil
 Hemp oil
 Jojoba oil
 Linseed oil
 Mustard oil
 Palm kernel oil
 Palm oil
 Peanut oil
 Rape oil
 Rice bran oil
 Safflower oil
 Soapstocks
 Soybean oil
 Sunflower oil
 Tall oil
 Tallow

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (production of fatty acid alkyl esters with caustic and lipase)

IT Bases

RL: CAT (Catalyst use); USES (Uses)
 (production of fatty acid alkyl esters with caustic and lipase)

IT Fatty acids

RL: BYP (Byproduct); PREP (Preparation)
 (salts; production of fatty acid alkyl esters with caustic and
 lipase)

IT Fats and Glyceridic oils

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (single-cell; production of fatty acid alkyl esters with caustic and
 lipase)

IT Palm oil

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (stearins; production of fatty acid alkyl esters with caustic and
 lipase)

IT 9001-62-1, Lipase

RL: BCP (Biochemical process); CAT (Catalyst use); BIOL
 (Biological study); PROC (Process); USES (Uses)
 (production of fatty acid alkyl esters with caustic and lipase)

IT 67-56-1, Methanol, reactions

RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
 PROC (Process); RACT (Reactant or reagent)
 (production of fatty acid alkyl esters with caustic and lipase)

IT 56-81-5P, Glycerol, preparation

RL: BYP (Byproduct); PREP (Preparation)
 (production of fatty acid alkyl esters with caustic and lipase)

IT 124-41-4, Sodium methoxide 865-33-8, Potassium methoxide 1310-58-3,
 Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses 7664-38-2,
 Phosphoric acid, uses 7664-93-9, Sulfuric acid, uses
 RL: CAT (Catalyst use); USES (Uses)
 (production of fatty acid alkyl esters with caustic and lipase)

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 9 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN
 ACCESSION NUMBER: 2015:1518420 HCAPLUS Full-text
 DOCUMENT NUMBER: 164:213155
 TITLE: In situ immobilized lipase on the surface of

intracellular polyhydroxybutyrate granules:
Preparation, characterization, and its promising use
for the synthesis of fatty acid alkyl esters

AUTHOR(S): Yang, Taek Ho; Kwon, Min-A.; Lee, Ji Young; Choi, Ji-Eun; Oh, Joon Young; Song, Jae Kwang

CORPORATE SOURCE: R&D Center, Genofocus Inc., Daejeon, 305-500, S. Korea

SOURCE: Applied Biochemistry and Biotechnology (2015), 177(7), 1553-1564

CODEN: ABIBDL; ISSN: 0273-2289

DIGITAL OBJECT ID: 10.1007/s12010-015-1836-3

PUBLISHER: Springer

DOCUMENT TYPE: Journal; (online computer file)

LANGUAGE: English

AB Photobacterium lipolyticum M37 lipase (LipM37) was immobilized on the surface of intracellular polyhydroxybutyrate (PHB) granules in Escherichia coli. LipM37 was genetically fused to Cupriavidus necator PHA synthase (PhaCCn), and the engineered PHB operon containing the lipM37-phaCCn successfully mediated the accumulation of PHB granules (85 weight%) inside E. coli cells. The PHB granules were isolated from the crude cell extract, and the immobilized LipM37 was comparable with the free form of LipM37 except for a favorable increase in thermostability. The immobilized LipM37 was used to synthesize oleic acid Me ester (biodiesel) and oleic acid dodecyl ester (wax ester), and yielded 98.0 % conversion in esterification of oleic acid and dodecanol. It was suggested that the LipM37-PhaCCn fusion protein successfully exhibited bifunctional activities in E. coli and that in situ immobilization of lipase to the intracellular PHB could be a promising approach for expanding the biocatalytic toolbox for industrial chemical synthesis.

CC 16-5 (Fermentation and Bioindustrial Chemistry)
Section cross-reference(s): 3

ST lipase immobilization polyhydroxybutyrate granule fatty acid alkyl ester biosynthesis; chimeric lipase PHA synthase prodn immobilization Escherichia transesterification

IT Fatty acids
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(alkyl esters; in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)

IT Organelle
(granule; in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)

IT Biodiesel fuel
Cupriavidus necator
Enzymic esterification
Escherichia coli
Photobacterium lipolyticum
Temperature effects, biological
Thermal stability
pH
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)

IT Olive oil
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)

- IT Waxes
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT Chimeric fusion proteins
RL: BCP (Biochemical process); BPN (Biosynthetic preparation); CAT (Catalyst use); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation); PROC (Process); USES (Uses)
(lipase-PHA synthase; in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT Chimeric gene, microbial
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(lipM37-phaCCn; in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT 9001-62-1P, Lipase
RL: BCP (Biochemical process); BPN (Biosynthetic preparation); CAT (Catalyst use); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation); PROC (Process); USES (Uses)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT 67-56-1, Methanol, reactions
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT 112-62-9P, Oleic acid methyl ester 36078-10-1P, Oleic acid dodecyl ester
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT 52352-27-9P, Polyhydroxybutyric acid 134688-88-3P, PHA synthase
RL: BPN (Biosynthetic preparation); BUU (Biological use, unclassified); BIOL (Biological study); PREP (Preparation); USES (Uses)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- IT 112-80-1P, Oleic acid, preparation 27342-88-7P, Dodecanol
RL: BPN (Biosynthetic preparation); RCT (Reactant); BIOL (Biological study); PREP (Preparation); RACT (Reactant or reagent)
(in situ immobilization of lipase on surface of intracellular polyhydroxybutyrate granules and use for synthesis of fatty acid alkyl esters)
- OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)
- REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 10 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN
ACCESSION NUMBER: 2014:2125339 HCAPLUS Full-text
DOCUMENT NUMBER: 163:700060
TITLE: Functional monoesters of jojoba oil can be

produced by enzymatic interesterification: Reaction
analysis and structural characterization

AUTHOR(S): Lei, Qiong; Li, Tianhu
CORPORATE SOURCE: Division of Chemistry and Biological Chemistry, School
of Physical and Mathematical Sciences, Nanyang
Technological University, Singapore
SOURCE: European Journal of Lipid Science and Technology
(2015), 117(5), 630-636
CODEN: EJLTFM; ISSN: 1438-7697
DIGITAL OBJECT ID: 10.1002/ejlt.201400458
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB Long-chain monounsaturated fatty acid Et esters (LMFAEE) and fatty alcohols acetates (LMFAA) are important functional compounds in industry, and new sources are needed. In this study, jojoba oil was interesterified with Et acetate (EA) for the combined production of LMFAEE and LMFAA. Lipozyme RM IM and Novozym 435 were employed as the biocatalyst and their efficiencies were compared. Aliquot removal and subsequent ¹H NMR analysis were used to monitor reaction progress and determine the interesterification yield (IY, %). Optimization of this reaction was conducted for both lipases with respect to four experimental parameters: temperature, EA content, immobilized lipase load, and reaction time. The highest IY in the presence of Novozym 435 was 97%, which was achieved after 9 h of reaction at 37°C with 75 wt% EA and 5.00 wt% lipase load at 300 rpm, whereas the IY was 76% in the case of Lipozyme RM IM. The interesterified product was purified by preparative TLC and characterized by ¹H NMR, FT-IR and GC-MS, indicating the main components are Et cis-11-eicosenoate (44%), cis-11-eicosenyl acetate (25%) and cis-13-docosenyl acetate (22%). Novozym 435 exhibited excellent operational stability over 17 interesterification cycles with ca. 12% IY decrease. Practical applications: Conversion of the rare LMFA-acid/alcohol source from jojoba oil to LMFAEE and LMFAA was realized in a one step interesterification reaction. The obtained jojobyl LMFAEE and LMFAA, in mixture or purified form, can serve as functional ingredients in various upmarket products, such as functional lipids, fragrances, cosmetics, pharmaceuticals and lubricants. Cis-11-eicosenyl acetate and cis-13-docosenyl acetate are also important insect pheromones in biological study. Additionally, the lipase reuse can help reduce cost significantly, making jojoba oil more economically attractive for industrial application. Jojoba oil was converted to long-chain monounsaturated fatty acid Et ester (LMFAEE) and fatty alcohol acetate (LMFAA) via enzymic interesterification with Et acetate. The resulting jojobyl LMFAEE and LMFAA have great potential for various upmarket applications in both industry and academia (e.g., fragrance, cosmetic, pharmaceutical and insect pheromone).

CC 17-9 (Food and Feed Chemistry)

ST jojoba oil monoester enzyme interesterification

IT Immobilization, animal
Temperature effects, biological
Transesterification
(functional monoesters including long-chain monounsaturated fatty acid Et ester and long-chain monounsaturated fatty alcohol acetate and LMFAA of jojoba oil was produced by enzymic interesterification with alcohol acetate)

IT Jojoba oil
RL: BSU (Biological study, unclassified); FFD (Food or feed use); BIOL (Biological study); USES (Uses)
(functional monoesters including long-chain monounsaturated fatty acid Et ester and long-chain monounsaturated fatty alcohol acetate and LMFAA of jojoba oil was produced by enzymic interesterification with alcohol acetate)

- IT 57-10-3, Hexadecanoic acid, biological studies 57-11-4, Octadecanoic acid, biological studies 111-62-6 112-80-1, 9-Octadecenoic acid (9Z)-, biological studies 112-85-6, Docosanoic acid 124-06-1, Ethyl tetradecanoate 373-49-9 506-30-9, Eicosanoic acid 544-63-8, Tetradecanoic acid, biological studies 557-59-5, Tetracosanoic acid 628-97-7, Ethyl hexadecanoate 629-70-9 693-80-1, cis-9-Octadecenyl acetate 822-23-1 822-24-2 822-26-4, 1-Docosanyl acetate 822-29-7, 1-Tetracosanyl acetate 5908-87-2, Ethyl docosanoate 9001-62-1, Lipase 16725-53-4, cis-9-Tetradecenyl acetate 18281-05-5, Ethyl eicosanoate 24634-95-5, Ethyl tetracosanoate 28929-01-3 28933-89-3 31152-46-2 37910-77-3 56219-10-4 66731-37-1 103213-57-6 137202-21-2 137888-64-3 1823102-39-1
RL: BSU (Biological study, unclassified); BIOL (Biological study) (functional monoesters including long-chain monounsaturated fatty acid Et ester and long-chain monounsaturated fatty acid acetate and LMFAA of jojoba oil was produced by enzymic interesterification with alc. acetate)
- IT 287970-25-6, Lipozyme RM IM
RL: BSU (Biological study, unclassified); FFD (Food or feed use); BIOL (Biological study); USES (Uses) (functional monoesters including long-chain monounsaturated fatty acid Et ester and long-chain monounsaturated fatty acid acetate and LMFAA of jojoba oil was produced by enzymic interesterification with alc. acetate)
- IT 1435939-45-9, Novozym 435
RL: BSU (Biological study, unclassified); FFD (Food or feed use); BIOL (Biological study); USES (Uses) (immobilized Candida antarctica Lipase B (CaLB); functional monoesters of jojoba oil can be produced by enzymic interesterification)
- REFERENCE COUNT: 33 THERE ARE 33 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 11 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN
ACCESSION NUMBER: 2014:1549131 HCAPLUS Full-text
DOCUMENT NUMBER: 161:479718
TITLE: Integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil
INVENTOR(S): Aracil Mira, Jose; Martinez Rodriguez, Mercedes; El Boulifi, Nourdeddin; Sanchez Rodriguez, Marcos; Serrano Martinez, Marta
PATENT ASSIGNEE(S): Universidad Complutense de Madrid, Spain
SOURCE: PCT Int. Appl., 40pp.; Chemical Indexing Equivalent to 161:493249 (ES)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Spanish
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014140392	A1	20140918	WO 2014-ES39	20140314

W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG,

SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
 UZ, VC, VN, ZA, ZM, ZW
 RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR,
 HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS,
 SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM,
 ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW,
 SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM

ES 2494620 A1 20140915 ES 2013-261 20130315

ES 2494620 B2 20150416

PRIORITY APPLN. INFO.: ES 2013-261 A 20130315

AB The invention concerns the transesterification of jojoba oil in the presence of low- and medium-mol. weight alcs. using enzymic, heterogenous or homogeneous catalysts. The reaction product is subjected to various crystallization stages in a system of pure organic solvents or a polar/apolar solvent mixture. The method enables different mixts. of high-purity unsatd. fatty alcs. to be obtained in oily liquid form, which can be used for the transdermal administration of pharmacol. agents. Monoalkylic esters which can be used as biodiesel or biodegradable products are obtained as byproducts.

IPCI C07C0033-025 [I]; C07C0069-52 [I]; C07C0067-03 [I]

IPCR C07C0033-025 [I]; C07C0067-03 [I]; C07C0069-52 [I]

CC 63-6 (Pharmaceuticals)

Section cross-reference(s): 7, 45, 52, 67

ST jojoba oil transesterification integrated prepn monounsaturated alc
 biodiesel bioproduct; transesterification jojoba oil monounsaturated
 fatty alc transdermal drug delivery

IT Fatty acids

RL: BYP (Byproduct); PREP (Preparation)

(Et esters; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Fatty acids

RL: BYP (Byproduct); NUU (Other use, unclassified); PREP (Preparation);
 USES (Uses)

(Me esters; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Fatty acids

RL: BYP (Byproduct); PREP (Preparation)

(alkyl esters; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil
)

IT Lubricants

Solvents

(bio-; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Drugs

(compns.; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Crystallization

(cryogenic; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Fractionation

(direct; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Liquid chromatography

(flash; integrated method of obtaining monounsaturated. alcs., biodiesel and biodegradable products from jojoba oil)

IT Biodegradable materials

Biodiesel fuel

Cryogenics

Filtration

Permeation enhancers
 Recrystallization
 Transdermal drug delivery systems
 Transesterification
 (integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT Jojoba oil
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT Alcohols
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (monounsaturated; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT Herpes
 Infection
 (subdermal, treatment of; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT Pseudozyma antarctica
 Rhizomucor miehei
 (triacylglycerol hydrolase produced by, as enzymic catalyst; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT Fatty alcohols
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (unsaturated; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 124-41-4, Sodium methoxide 865-33-8, Potassium methoxide
 RL: CAT (Catalyst use); USES (Uses)
 (dissolved in methanol; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses 9001-62-1, Lipase
 RL: CAT (Catalyst use); USES (Uses)
 (integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 506-42-3P 5634-26-4P 68760-58-7P 1627755-03-6P
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 64-17-5, Ethanol, reactions 71-36-3, 1-Butanol, reactions 29063-28-3, Octanol
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 67-56-1, Methanol, reactions
 RL: NUU (Other use, unclassified); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (solvent; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 7439-93-2, Lithium, uses 7440-09-7, Potassium, uses 7440-23-5, Sodium, uses 7440-39-3, Barium, uses 7440-70-2, Calcium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (supported on γ -alumina; integrated method of obtaining monounsaturated alcohols, biodiesel and biodegradable products from jojoba oil)

IT 1344-28-1, -Alumina, uses
 RL: CAT (Catalyst use); USES (Uses)
 (γ-, supporting Na, K, Li, Ca or Ba; integrated method of
 obtaining monounsaturated alcs., biodiesel and biodegradable products from
 jojoba oil)
 REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 12 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN
 ACCESSION NUMBER: 2014:1667404 HCAPLUS Full-text
 DOCUMENT NUMBER: 161:493249
 TITLE: Integrated method of obtaining monounsaturated
 alcohols, biodiesel and biodegradable products from
 jojoba oil
 INVENTOR(S): Aracil Mira, Jose; Martinez Rodriguez, Mercedes; El
 Boulifi, Nourdeddin; Sanchez Rodriguez, Marcos;
 Serrano Martinez, Marta
 PATENT ASSIGNEE(S): Universidad Complutense de Madrid, Spain
 SOURCE: Span., 36pp.; Chemical Indexing Equivalent to
 161:479718 (WO)
 CODEN: SPXXAD
 DOCUMENT TYPE: Patent
 LANGUAGE: Spanish
 FAMILY ACC. NUM. COUNT: 2
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
ES 2494620	A1	20140915	ES 2013-261	20130315
ES 2494620	B2	20150416		
WO 2014140392	A1	20140918	WO 2014-ES39	20140314
W: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW				
RW: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, RU, TJ, TM				

PRIORITY APPLN. INFO.: ES 2013-261 A 20130315
 AB The invention concerns the transesterification of jojoba oil in the presence
 of low- and medium-mol. weight alcs. using enzymic, heterogeneous or
 homogeneous catalysts. The reaction product is subjected to various
 crystallization stages in a system of pure organic solvents or a polar/apolar
 solvent mixture. The method enables different mixts. of high-purity unsaturated
 fatty alcs. to be obtained in oily liquid form, which can be used for the
 transdermal administration of pharmacol. agents. Monoalkylic esters which can
 be used as biodiesel or biodegradable products are obtained as byproducts.
 IPCI C07C0033-025 [I]; C07C0067-03 [I]; C07C0069-52 [I]; C07C0033-025;
 C07C0067-03; C07C0069-52
 IPCR C07C0033-025 [I]; C07C0067-03 [I]; C07C0069-52 [I]
 CC 63-6 (Pharmaceuticals)
 Section cross-reference(s): 7, 45, 52, 67
 ST jojoba oil transesterification integrated prepn monounsaturated alc
 biodiesel bioproduct; transesterification jojoba oil monounsaturated

fatty alc transdermal drug delivery

IT Fatty acids
 RL: BYP (Byproduct); PREP (Preparation)
 (Et esters; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Fatty acids
 RL: BYP (Byproduct); NUU (Other use, unclassified); PREP (Preparation); USES (Uses)
 (Me esters; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Fatty acids
 RL: BYP (Byproduct); PREP (Preparation)
 (alkyl esters; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Lubricants
 Solvents
 (bio-; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Drugs
 (compns.; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Crystallization
 (cryogenic; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Fractionation
 (direct; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Liquid chromatography
 (flash; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Biodegradable materials
 Biodiesel fuel
 Cryogenics
 Filtration
 Permeation enhancers
 Recrystallization
 Transdermal drug delivery systems
 Transesterification
 (integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Jojoba oil
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Alcohols
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (monounsaturated.; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Herpes
 Infection
 (subdermal, treatment of; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT Pseudozyma antarctica
 Rhizomucor miehei
 (triacylglycerol hydrolase produced by, as enzymic catalyst; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable

products from jojoba oil)

IT Fatty alcohols
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (unsatd.; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 124-41-4, Sodium methoxide 865-33-8, Potassium methoxide
 RL: CAT (Catalyst use); USES (Uses)
 (dissolved in methanol; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses 9001-62-1, Lipase
 RL: CAT (Catalyst use); USES (Uses)
 (integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 506-42-3P 5634-26-4P 68760-58-7P 1627755-03-6P
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 64-17-5, Ethanol, reactions 71-36-3, 1-Butanol, reactions 29063-28-3, Octanol
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 67-56-1, Methanol, reactions
 RL: NUU (Other use, unclassified); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (solvent; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 7439-93-2, Lithium, uses 7440-09-7, Potassium, uses 7440-23-5, Sodium, uses 7440-39-3, Barium, uses 7440-70-2, Calcium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (supported on γ -alumina; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

IT 1344-28-1, -Alumina, uses
 RL: CAT (Catalyst use); USES (Uses)
 (γ -, supporting Na, K, Li, Ca or Ba; integrated method of obtaining monounsaturated alcs., biodiesel and biodegradable products from jojoba oil)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L107 ANSWER 13 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 2010:1248972 HCAPLUS Full-text

DOCUMENT NUMBER: 153:455184

TITLE: Oil migration inhibiting additives, fat/oil compositions containing the additives, and food containing the compositions

INVENTOR(S): Sakai, Midori; Murayama, Shigeyuki

PATENT ASSIGNEE(S): Kaneka Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 10pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2009-68182 20090319

CARGILL 00000259

DIGITAL OBJECT ID: 10.1002/jctb.1208
 PUBLISHER: John Wiley & Sons Ltd.
 DOCUMENT TYPE: Journal
 LANGUAGE: English

- AB Biodiesel has attracted considerable attention as an alternative fuel during the past decades. The main hurdle to the commercialization of biodiesel is the cost of the raw material. Use of an inexpensive raw material such as rice bran oil is an attractive option to lower the cost of biodiesel. Two com. available immobilized lipases, Novozym 435 and IM 60, were employed as catalyst for the reaction of rice bran oil and methanol. Novozym 435 was found to be more effective in catalyzing the methanolysis of rice bran oil. Methanolysis of refined rice bran oil and fatty acids (derived from rice bran oil) catalyzed by Novozym 435 (5% based on oil weight) can reach a conversion of over 98% in 6 h and 1 h, resp. Methanolysis of rice bran oil with a free fatty acid content higher than 18% resulted in lower conversions (<68%). A two-step lipase-catalyzed methanolysis of rice bran oil was developed for the efficient conversion of both free fatty acid and acylglycerides into fatty acid Me ester. More than 98% conversion can be obtained in 4-6 h depending on the relative proportion of free fatty acid and acylglycerides in the rice bran oil. Inactivation of lipase by phospholipids and other minor components was observed during the methanolysis of crude rice bran oil. Simultaneous dewaxing/degumming proved to be efficient in removing phospholipids and other minor components that inhibit lipase activity from crude rice bran oil.
- CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 7, 11
- ST biodiesel prodn rice bran oil lipase
- IT Diesel fuel substitutes
 (biodiesel; lipase catalyzed production of biodiesel from rice bran oil)
- IT Enzymes
 RL: CAT (Catalyst use); USES (Uses)
 (immobilized; lipase catalyzed production of biodiesel from rice bran oil)
- IT Alcoholysis
 Esterification
 Methanolysis
 Transesterification
 (lipase catalyzed production of biodiesel from rice bran oil)
- IT Fatty acids
 Glycerides
 RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
 (lipase catalyzed production of biodiesel from rice bran oil)
- IT Gums and Mucilages
 (removal; lipase catalyzed production of biodiesel from rice bran oil)
- IT Glycolipids
 Phospholipids
 Waxes
 RL: OCU (Occurrence, unclassified); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)
 (removal; lipase catalyzed production of biodiesel from rice bran oil)
- IT Fats and Glyceridic oils
 RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (rice bran, saponified, dewaxed/degummed; lipase catalyzed production of biodiesel from rice bran oil)

IT Fatty acids
 RL: PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
 (rice bran-oil, Me esters; lipase catalyzed production of biodiesel from rice bran oil)

IT 1435939-45-9, Novozym 435
 RL: CAT (Catalyst use); USES (Uses)
 (lipase catalyzed production of biodiesel from rice bran oil)

IT 67-56-1, Methanol, processes 7637-07-2, Boron trifluoride, processes
 RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (lipase catalyzed production of biodiesel from rice bran oil)

OS.CITING REF COUNT: 83 THERE ARE 83 CAPLUS RECORDS THAT CITE THIS RECORD (83 CITINGS)

REFERENCE COUNT: 26 THERE ARE 26 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

Esterification o fish, not jojoba , but combine

L107 ANSWER 15 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN
 ACCESSION NUMBER: 2005:598499 HCAPLUS Full-text
 DOCUMENT NUMBER: 144:68628
 TITLE: Formation of a new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase
 AUTHOR(S): Tsuchiya, Daijuke; Murakami, Yoshimasa; Ogoma, Yoshiro; Kondo, Yoshiyuki; Uchio, Fyousuke; Yamanaka, Shigeru
 CORPORATE SOURCE: Graduate School of Science and Technology, Shinshu University, Ueda-shi, Nagano, 386-8567, Japan
 SOURCE: Journal of Molecular Catalysis B: Enzymatic (2005), 35(1-3), 52-56
 CODEN: JMCEB8; ISSN: 1381-1177
 DIGITAL OBJECT ID: 10.1016/j.molcatb.2005.05.005
 PUBLISHER: Elsevier B.V.
 DOCUMENT TYPE: Journal
 LANGUAGE: English

AB We identified a new interesterification reaction between tripalmitin and dicarboxylic acid using lipase. Tripalmitin and dicarboxylic acid were incubated at 70 °C for 72 h with Lipozyme RM IM. The reaction mixture was analyzed by MALDI TOF-MS and liquid chromatog./mass spectrometry. The products found were a dimer [($\alpha(\gamma)$, β -dipalmitoyl)- glyceryl]- $\gamma(\alpha)$ -(ω -carbooctadecanoyl)- $\alpha'(\gamma')$, β' -dipalmitoyl-glycerol and oligomers of glyceride. This dimer was also found in Japan wax, traditionally used as cosmetics.

CC 16-2 (Fermentation and Bioindustrial Chemistry)

ST lipase transesterification tripalmitin dicarboxylic acid

IT Fats and Glyceridic oils
 RL: BSU (Biological study, unclassified); BIOL (Biological study)
 (Japan wax; formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

IT Carboxylic acids
 RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
 (dicarboxylic; formation of new ester compound between triglyceride and

dicarboxylic acid catalyzed by lipase)

IT Transesterification
(formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

IT Glycerides
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
PROC (Process); RACT (Reactant or reagent)
(formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

IT 9001-62-1, Lipase
RL: BCP (Biochemical process); CAT (Catalyst use); BIOL (Biological study); PROC (Process); USES (Uses)
(formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

IT 110-15-6, Succinic acid, reactions 110-94-1, Glutaric acid 111-20-6, Sebacic acid, reactions 124-04-9, Adipic acid, reactions 555-44-2, Tripalmitin 821-38-5, 1,14-Tetradecanedioic acid
RL: BCP (Biochemical process); RCT (Reactant); BIOL (Biological study);
PROC (Process); RACT (Reactant or reagent)
(formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

IT 125646-14-2P 130447-62-0P 130447-67-5P 872058-86-1P 872058-88-3P
872058-91-8P 872058-94-1P 872058-97-4P 872059-00-2P 872059-02-4P
872059-04-6P 872059-07-9P
RL: BPN (Biosynthetic preparation); PRP (Properties); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation)
(formation of new ester compound between triglyceride and dicarboxylic acid catalyzed by lipase)

OS.CITING REF COUNT: 5 THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD (5 CITINGS)

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 16 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 1999:223072 HCAPLUS Full-text

DOCUMENT NUMBER: 130:248767

TITLE: Surfactant-lipase complex immobilized on insoluble matrix

INVENTOR(S): Bashir, Sobhi

PATENT ASSIGNEE(S): Enzymothec Ltd., Israel; Friedman, Mark, M.

SOURCE: PCT Int. Appl., 54 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 3

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9915689	A1	19990401	WO 1998-US15799	19980728
W:	AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW			
RW:	GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG			
AU 9887608	A	19990412	AU 1998-87608	19980728
US 6605452	B1	20030812	US 1999-274545	19990323

PRIORITY APPLN. INFO.:

US 1997-936690

A 19970924

WO 1998-US15799

W 19980728

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A lipase or phospholipase preparation which includes an insol. matrix and a surfactant-coated lipase complex immobilized onto the insol. matrix are claimed. A method of preparing an insol. matrix-immobilized surfactant-coated lipase complex which includes the steps of (a) contacting a lipase, an insol. matrix and a surfactant in an aqueous solution; and (b) providing conditions for a formation of the matrix-immobilized surfactant-coated lipase complex. Coating lipases with a lipid surfactant, such as fatty acid sugar ester types, lead to activation of the lipases for uses in organic synthesis and in most cases the modification process converts relatively inactive crude lipases to highly active biocatalysts. The immobilized surfactant-coated lipases may be used to catalyze inter-esterification reactions between triglycerides and fatty acids, one-step alcoholysis reactions between triglycerides and fatty alcs. for production of wax esters, and also transesterification reactions between two different triglyceride mols. or between 2 different oils.

IPCI C12P0007-64 [ICM,6]; C12N0011-14 [ICS,6]; C12N0009-20 [ICS,6]

IPCR C12N0009-20 [I]; C12N0011-08 [I]; C12N0011-14 [I]; C12P0007-64 [I]

CC 7-7 (Enzymes)
Section cross-reference(s): 16, 17, 21

ST surfactant coated lipase immobilization insol matrix

IT Canola oil
Corn oil
Cottonseed oil
Fatty acids, biological studies
Olive oil
Palm oil
Sunflower oil
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(biocatalytic esterification and/or alcoholysis reactions of;
surfactant-lipase complex immobilized on insol. matrix)

IT Esterification
(biochem.; surfactant-lipase complex immobilized on insol.
matrix)

IT Transesterification
(biol.; surfactant-lipase complex immobilized on insol.
matrix)

IT Fatty acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(conjugates; surfactant-lipase complex immobilized on insol.
matrix)

IT Fats and Glyceridic oils
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(fish, biocatalytic esterification and/or alcoholysis
reactions of; surfactant-lipase complex immobilized on insol.
matrix)

IT Bioreactors
Bioreactors
(fixed-bed; surfactant-lipase complex immobilized on insol.
matrix)

IT Milk substitutes
(human, manufacture of; surfactant-lipase complex immobilized on
insol. matrix)

IT Carboxyl group
Phosphate group
(hydrophilic moiety conjugated to fatty acid; surfactant-lipase
complex immobilized on insol. matrix)

IT Aspergillus niger

Burkholderia
 Candida antarctica
 Candida cylindracea
 Humicola
 Microorganism
 Mucor javanicus
 Pseudomonas
 Pseudomonas fluorescens
 Rhizomucor miehei
 Rhizopus
 Rhizopus japonicus
 Rhizopus javanicus
 Rhizopus oryzae
 Swine
 (lipase from; surfactant-lipase complex immobilized
 on insol. matrix)
 IT Cocoa butter substitutes
 (manufacture of; surfactant-lipase complex immobilized on insol.
 matrix)
 IT Nigella sativa
 (oil, biocatalytic esterification and/or alcoholysis
 reactions of; surfactant-lipase complex immobilized on insol.
 matrix)
 IT Solvents
 (organic; surfactant-lipase complex immobilized on insol.
 matrix)
 IT Bioreactors
 Bioreactors
 (stirred-tank; surfactant-lipase complex immobilized on
 insol. matrix)
 IT Alcoholysis
 Asymmetric synthesis and induction
 Freeze drying
 Ion exchangers
 Protein immobilization
 Surfactants
 (surfactant-lipase complex immobilized on insol. matrix)
 IT Glycerides, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (surfactant-lipase complex immobilized on insol. matrix)
 IT Charcoal
 RL: TEM (Technical or engineered material use); USES (Uses)
 (surfactant-lipase complex immobilized on insol. matrix)
 IT Diatomite
 RL: TEM (Technical or engineered material use); USES (Uses)
 (surfactant-lipase complex immobilized on insol. matrix)
 IT Silica gel, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (surfactant-lipase complex immobilized on insol. matrix)
 IT 57-10-3, Palmitic acid, biological studies 57-11-4, Octadecanoic acid,
 biological studies 60-33-3, Linoleic acid, biological studies
 112-80-1, Oleic acid, biological studies 463-40-1, Linolenic acid
 506-32-1, Arachidonic acid 25167-62-8, Docosaheptaenoic acid
 25378-27-2, Eicosapentaenoic acid
 RL: BSU (Biological study, unclassified); BIOL (Biological study)
 (biocatalytic esterification and/or alcoholysis reactions of;
 surfactant-lipase complex immobilized on insol. matrix)
 IT 71-43-2, Benzene, uses 108-20-3, Diisopropyl ether 108-88-3, Toluene,
 uses 110-54-3, n-Hexane, uses 110-82-7, Cyclohexane, uses 111-65-9,

n-Octane, uses 540-84-1

RL: MOA (Modifier or additive use); USES (Uses)

(organic solvent; surfactant-lipase complex immobilized on insol. matrix)

IT 9001-62-1, Lipase

RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); CAT (Catalyst use); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process); USES (Uses)

(surfactant-lipase complex immobilized on insol. matrix)

IT 9013-93-8, Phospholipase

RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); PEP (Physical, engineering or chemical process); BIOL (Biological study); PROC (Process)

(surfactant-lipase complex immobilized on insol. matrix)

IT 50-70-4D, Sorbitol, hydrophilic moiety conjugated to fatty acid
50-99-7D, Glucose, hydrophilic moiety conjugated to fatty acid 57-50-1D,
Sucrose, hydrophilic moiety conjugated to fatty acid 63-42-3D, Lactose,
hydrophilic moiety conjugated to fatty acid 538-24-9, Trilaurin
555-43-1, Tristearin 555-44-2, Tripalmitin 555-45-3, Trimyristin
1323-83-7, Distearin 1338-39-2, Sorbitan monolaurate 1338-41-6,
Sorbitan monostearate 26266-57-9, Sorbitan monopalmitate 26657-95-4,
Dipalmitin 26657-96-5, Monopalmitin 27214-38-6, Monomyristin
27215-38-9, Monolaurin 27638-00-2, Dilaurin 31566-31-1, Monostearin
53563-63-6, Dimyristin 63059-79-0, Sorbitan monotetradecanoate
RL: MOA (Modifier or additive use); USES (Uses)

(surfactant-lipase complex immobilized on insol. matrix)

IT 471-34-1, Calcium carbonate, uses 1344-28-1, Alumina, uses 7778-18-9,
Calcium sulfate 9032-46-6, Sulfoethylcellulose 9050-97-9, Amberlite
IRA 900 9079-25-8, Amberlite 37199-22-7, Dowex 93356-75-3, Eupergit
C 101239-42-3, Eupergit 141489-76-1, Dowex 22 149531-08-8, Eupergit
C 250L

RL: TEM (Technical or engineered material use); USES (Uses)

(surfactant-lipase complex immobilized on insol. matrix)

OS.CITING REF COUNT: 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD
(4 CITINGS)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 17 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 1999:270351 HCAPLUS Full-text

DOCUMENT NUMBER: 131:70548

TITLE: Long-chain acyl thioesters prepared by solvent-free
thioesterification and transthioesterification
catalyzed by microbial lipases

AUTHOR(S): Weber, N.; Klein, E.; Mukherjee, K. D.

CORPORATE SOURCE: Institut fur Biochemie und Technologie der Fette, H.P.
Kaufmann-Institut, Munster, D-48147, Germany

SOURCE: Applied Microbiology and Biotechnology (1999), 51(3),
401-404

CODEN: AMBIDG; ISSN: 0175-7598

DIGITAL OBJECT ID: 10.1007/s002530051410

PUBLISHER: Springer-Verlag

DOCUMENT TYPE: Journal

LANGUAGE: English

OTHER SOURCE(S): CASREACT 131:70548

AB Long-chain acyl thioesters (thio wax esters) have been prepared in high (80%
to more than 90%) yields by solvent-free esterification of fatty acids
(lauric, myristic, palmitic and stearic acids) with long-chain thiols, such as

decane thiol, dodecane thiol, tetradecane thiol and hexadecane thiol, catalyzed by lipases from *Candida antarctica* (Novozym) and *Rhizomucor miehei* (Lipozyme) in the presence of a 0.4-nm mol. sieve. In the thioesterification reaction Novozym was a more effective biocatalyst than Lipozyme. The extent of thioesterification increased with increasing molar ratio of fatty acid to alkane thiol (1:1 to 3:1) and with temperature (40°C compared to 60°C), as well as with the amount of the enzyme preparation and the amount of 0.4-nm mol. sieve. Decreasing the chain length of the alkane thiol from C16 to C10 also increased the extent of thioesterification. Lipase-catalyzed solvent-free transthioesterification of fatty acid Me esters with alkane thiols was less effective for the preparation of acyl thioesters than was thioesterification of fatty acids with alkane thiols. In transthioesterification, Lipozyme was slightly more effective as a biocatalyst than Novozym.

- CC 9-1 (Biochemical Methods)
Section cross-reference(s): 7, 26
- ST long chain acyl thioester prepn thioesterification transthioesterification
lipase
- IT Fatty acids, biological studies
RL: BSU (Biological study, unclassified); PRP (Properties); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)
(Me esters; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Enzymes
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(Novozyme; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Fatty acids, biological studies
RL: BSU (Biological study, unclassified); PRP (Properties); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)
(long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Thiols (organic), biological studies
RL: BSU (Biological study, unclassified); PRP (Properties); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)
(long-chain; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Esters, preparation
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(thio; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Esterification
(thioesterification; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Transesterification
(transthioesterification; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT Structure-activity relationship
(triacylglycerol lipase substrate; long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)
- IT 9001-62-1D, Lipozyme, immobilized

RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); CAT (Catalyst use); BIOL (Biological study); USES (Uses)

(long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)

IT 2307-29-1P 2307-32-6P 2307-33-7P 2307-39-3P 2487-77-6P
103048-78-8P 103212-64-2P

RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)

(long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)

IT 57-10-3, Palmitic acid, biological studies 57-11-4, Octadecanoic acid, biological studies 111-82-0, Methyl laurate 112-55-0, 1-Dodecanethiol 143-07-7, Lauric acid, biological studies 143-10-2, Decane thiol 544-63-8, Myristic acid, biological studies 2917-26-2, Hexadecane thiol 94594-37-3, Tetradecane thiol

RL: BSU (Biological study, unclassified); PRP (Properties); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent)

(long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)

IT 1435939-45-9, Lipase B

RL: CAT (Catalyst use); USES (Uses)

(long-chain acyl thioesters prepared by solvent-free thioesterification and transthioesterification catalyzed by microbial lipases)

OS.CITING REF COUNT: 30 THERE ARE 30 CAPLUS RECORDS THAT CITE THIS RECORD (30 CITINGS)

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 18 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 1999:188676 HCAPLUS Full-text

DOCUMENT NUMBER: 130:313443

TITLE: Enzymic synthesis of wax esters from rapeseed fatty acid methyl esters and a fatty alcohol

AUTHOR(S): Hallberg, Marianne Lilja; Wang, Daobin; Harrod, Magnus
CORPORATE SOURCE: Department of Food Science, Chalmers University of Technology, Goteborg, SE-402 29, Swed.

SOURCE: Journal of the American Oil Chemists' Society (1999), 76(2), 183-187

CODEN: JAOCA7; ISSN: 0003-021X

DIGITAL OBJECT ID: 10.1007/s11746-999-0216-y

PUBLISHER: AOCS Press

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Wax esters were transesterified from fatty acid Me esters of rapeseed and 1-hexadecanol. The amts. of both the substrates were fixed to 0.1 mmol and an immobilized enzyme, Lipozyme, was used as catalyst. The experiment was performed following a statistic central composite design with five variables. The enzyme/lipid ratio was varied between 0.3-0.9 of the substrate weight and the enzyme was equilibrated to different water activities varying from 0.11 to 0.44. A temperature range of 50-80°C was investigated and the reaction time lasted up to 40 min. A solvent, isooctane, constituted 0-30% of the substrate weight. The first exptl. series was performed in small closed test tubes. In the second series the caps of the test tubes were off to evaporate the methanol produced during the reaction. The highest initial reaction rate was

9.6 gwax esters/genzyme · h. It appeared when: the enzyme/lipid ratio was low, 0.3, the temperature was high, 80°C; no isooctane was present; and the water activity was below 0.11. The initial reaction rate was independent of the caps on the test tubes. With the large amount of enzyme the yield of ~~wax~~ ~~esters~~ was above 70% after 10 min in both exptl. series. In the reaction with caps, the reaction reached equilibrium at 83% after 20 min at 80°C. However, without caps the continuous evaporation of methanol increased the equilibrium constantly, and after 40 min at 80°C a yield of 90% was reached.

CC 45-3 (Industrial Organic Chemicals, Leather, Fats, and Waxes)
 Section cross-reference(s): 16
 ST enzymic transesterification fatty acid ester hexadecanol; lipase
 catalyst transesterification rapeseed fatty ester
 IT Transesterification catalysts
 (enzymic; for synthesis of ~~wax~~ ~~esters~~ from rapeseed
 fatty acid Me esters and hexadecanol)
 IT Fatty acids, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (rape-oil, Me ~~esters~~; enzymic synthesis of ~~wax~~
~~esters~~ from rapeseed fatty acid Me esters and hexadecanol)
 IT Fatty acids, preparation
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (rape-oil, ~~esters~~; enzymic synthesis of ~~wax~~
~~esters~~ from rapeseed fatty acid Me esters and hexadecanol)
 IT 36653-82-4, 1-Hexadecanol
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (enzymic synthesis of ~~wax~~ ~~esters~~ from rapeseed
 fatty acid Me esters and)
 IT 9001-62-1, Lipozyme
 RL: CAT (Catalyst use); USES (Uses)
 (in enzymic synthesis of ~~wax~~ ~~esters~~ from rapeseed
 fatty acid Me esters and hexadecanol)
 OS.CITING REF COUNT: 24 THERE ARE 24 CAPLUS RECORDS THAT CITE THIS
 RECORD (24 CITINGS)
 REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L107 ANSWER 19 OF 46 HCAPLUS COPYRIGHT 2016 ACS on STN

ACCESSION NUMBER: 1995:576772 HCAPLUS Full-text

DOCUMENT NUMBER: 122:313073

ORIGINAL REFERENCE NO.: 122:56937a

TITLE: Transesterification with powdered lipase in the
 absence of water

INVENTOR(S): Negishi, Satoshi; Shirasawa, Seiichi; Suzuki, Junko;
 Murui, Takeo

PATENT ASSIGNEE(S): Nisshin Oil Mills Ltd, Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 07079789	A	19950328	JP 1993-231629	19930917
US 5480787	A	19960102	US 1994-296921	19940831
CN 1111285	A	19951108	CN 1994-115396	19940916
CN 1079115	C	20020213		

PRIORITY APPLN. INFO.: JP 1993-231629 A 19930917

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT