

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VANTAGE SPECIALTY CHEMICALS, INC.

Petitioner,

v.

CARGILL, INCORPORATED,

Patent Owner

Case IPR2023-00589
U.S. Patent 11,248,245

PATENT OWNER'S RESPONSE

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LIST OF EXHIBITS

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2003	Claim Construction Memorandum Opinion (Dkt No. 63) filed in <i>Cargill, Incorporated v. Vantage Specialty Chemicals, Inc.</i> , No. 1:22-cv-00979-RGA-SRF (D. Del. June 5, 2023)
2004	Excerpt of United States District Courts, Federal Court Management Statistics Report for the 12-month period ending March 31, 2023, <i>available at</i> https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0331.2023.pdf
2005	Initial Invalidity Contentions (Dkt No. 27) filed in <i>Cargill, Incorporated v. Vantage Specialty Chemicals, Inc.</i> , No. 1:22-cv-00979-RGA-SRF (D. Del. Jan. 19, 2023)
2006	Markman Claim Construction Order (Dkt No. 67) filed in <i>Cargill, Incorporated v. Vantage Specialty Chemicals, Inc.</i> , No. 1:22-cv-00979-RGA-SRF (D. Del. June 15, 2023)
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2052	CONFIDENTIAL – [REDACTED] [REDACTED]
2053	CONFIDENTIAL – [REDACTED] [REDACTED]
2054	CONFIDENTIAL – [REDACTED] [REDACTED]

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I. INTRODUCTION

U.S. Patent No. 11,248,245 (“the ’245 Patent”) covers a method for making Patent Owner Cargill’s Floraesters® jojoba wax ester products, which among other things provide emollience and oxidative stability to skin care products and cosmetics. Traditionally, jojoba wax esters were transesterified using chemical catalysts. The inventors unexpectedly discovered that lipases were able to transesterify jojoba wax esters. Even more surprising, they discovered unexpected advantages when lipases were used, such as enhanced oxidative stability of the wax esters, and products having improved properties with respect to appearance and viscosity.

Vantage fails to present any ground in which the claims are rendered obvious by the combinations of references in the ground. In fact, none of Vantage’s references, whether alone or in combination, discloses or suggests each and every claim limitation. All four grounds of Vantage’s Petition suffer from at least two critical deficiencies: first, Vantage’s prior art does not disclose or suggest transesterifying a feedstock of jojoba wax esters and hydrogenated jojoba wax esters by “contacting the feedstock with a lipase,” and second, Vantage’s prior art does not disclose or suggest that the “oxidative stability index (OSI) of the transesterified product is greater than the OSI of the feedstock” for the claimed

process. Vantage has not met its burden to demonstrate the claims are unpatentable.

First, Vantage's prior art does not provide a single example of a lipase being used to transesterify jojoba wax esters. Lipases are enzymes that, prior to the '245 Patent, were known to be specific to triglycerides. EX-2009, ¶64; *see also* EX-2033, 1; EX-2034, 6; EX-2035, 10. Jojoba wax esters are not triglycerides. *Compare* EX-2009, ¶48 *with id.*, ¶¶50-53. In fact, although they are sometimes referred to as "jojoba oil," jojoba wax esters are not a true oil; rather, they make up what is correctly referred to as a liquid wax. *See id.*, ¶52; *see also* EX-2025, 3-4; *see also* EX-1004, 1. Lipases were known to work with triglycerides because of their ability to bind to their glycerol backbone. EX-2009, ¶72; EX-2028, 2. But, unlike triglycerides, jojoba wax esters do not have this glycerol backbone. EX-2009, ¶85. Vantage's Petition does not explain why a POSITA at the time of the invention would have been motivated to use lipases with jojoba wax esters or have had a reasonable expectation of success in doing so. The fact that lipases do work on jojoba wax esters, when jojoba wax esters lack the specific structure required by the active site of every known lipase, was astonishing at the time the '245 Patent issued and is still not understood today. *Id.*, ¶87. Vantage has failed to show that a process of "transesterifying the jojoba wax esters and the hydrogenated jojoba wax

esters in the feedstock with the lipase to form a transesterified product” was obvious.

Second, Vantage’s grounds do not include any examples comparing the OSI of a feedstock of jojoba wax esters and hydrogenated jojoba wax esters with transesterified product, much less showing that “an oxidative stability index (OSI) of the transesterified product is greater than an OSI of the feedstock” after a lipase-based transesterification. The references never compare the OSI of the feedstock to the transesterified product—this critical comparison is missing from all of the grounds. Moreover, OSI depends largely on the number of double bonds present in a composition. *Id.*, ¶55. A POSITA would not have expected an increase in OSI in the claimed process where, as Vantage’s own expert agrees, the number of double bonds in the feedstock and the transesterified product *stays the same*. *Id.*, ¶109. At most, a POSITA would have expected the OSI of the jojoba wax product not to change during the claimed transesterification process. *Id.* Nevertheless, when a lipase is used on jojoba wax esters, the oxidative stability goes up, even though no double bonds are lost. Vantage’s Petition provides no explanation for this phenomenon, and nothing in Vantage’s prior art suggests that such a result would have been reasonably expected at the time of the invention.

Secondary considerations further support the non-obviousness of the ’245 Patent. In addition to unexpected results described above, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Accordingly, the Board should find claims 1-3, and 5 of the '245 Patent patentable.

II. BACKGROUND

A. Personal Care Products

Personal care products encompass a wide range of goods designed for individual grooming, hygiene, self-care and overall enhancement of personal appearance and well-being. EX-2009, ¶43. In the personal care products industry, oils have historically been used to formulate products with desirable cosmetic and functional properties. *Id.*, ¶44. With the rise of mass production of personal care products in the 20th century, petroleum-based oil derivatives such as petroleum

jelly became prominent due to their high stability and low cost. *Id.*; EX-2061, 59-60; EX-2016, 16. The personal care industry continues to shift away from petroleum-based oils toward naturally derived alternatives that have fewer health and safety concerns. EX-2009, ¶44; EX-2016, 16–17.

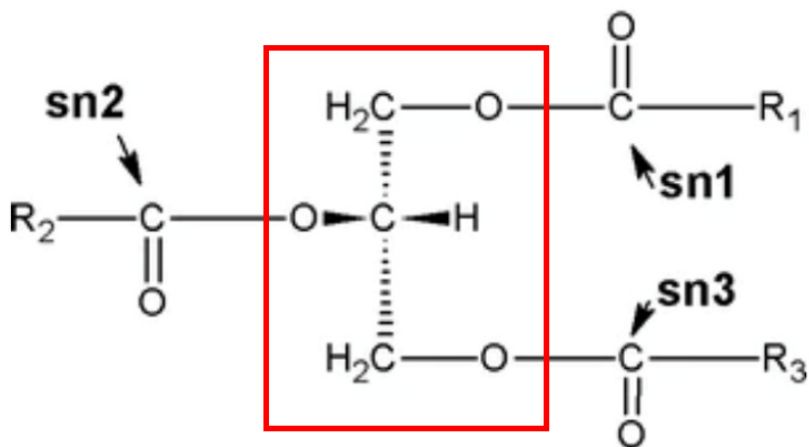
Stability is a key performance parameter for any material used in these applications. EX-2009, ¶45; EX-2061, 32; EX-2020, 447. For oils used in personal care products, oxidative stability is particularly important. EX-2009, ¶45. Addition of antioxidants, such as tocopherols, can be used to prevent or slow down oxidation. EX-2009, ¶45; EX-2061, 4.

While natural oils can be supplemented with antioxidants to improve oxidative stability, antioxidants are expensive, and therefore incorporating them into a formulation can significantly increase the associated manufacturing costs. EX-2009, ¶46; EX-2023, Abstract . A desire thus exists for natural oils that have greater oxidative stability, thereby requiring the use of fewer antioxidants and further extending the shelf-life of finished products. EX-2009, ¶46.

B. Chemical Structure of Naturally Derived Oils and Jojoba Wax Esters

Almost all naturally derived oils are made of triglycerides. EX-2009, ¶47. Triglycerides have a specific chemical structure—i.e., three fatty acid chains each attached to a single glycerol backbone through an ester linkage. EX-2009, ¶48. A

fatty acid chain is a hydrocarbon chain with a terminal carboxyl (COOH) group that forms an ester linkage with the glycerol backbone. *Id.* An example triglyceride structure is shown below, with the glycerol backbone shown in the red box.



Triglyceride Structure.

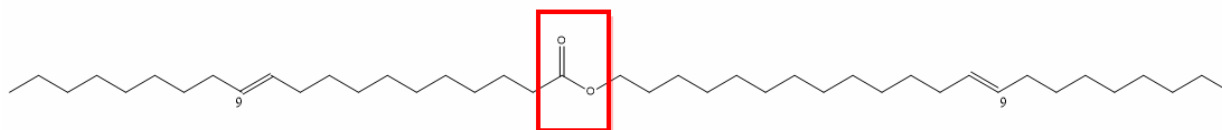
Id.

The positions of the fatty acid chains on the glycerol head are generally indicated as the *sn*-1, *sn*-2, and *sn*-3 positions, as shown above with the *sn*-2 position being center. EX-2009, ¶48; EX-2062, 1. The fatty acid chains in triglycerides generally have between sixteen and eighteen carbons each. EX-2009, ¶49.

Jojoba wax esters are unique among seed oils (i.e. oils derived from the seeds of plants) in part because they do not share the triglyceride structure of other oils. EX-2009, ¶50; *see also* EX-1004, 1. Thus, while sometimes referred to as

“jojoba oil,” the compositions extracted from jojoba seeds are not in fact oils.

Instead, they are composed of almost 98% pure waxes, primarily wax esters. EX-2009, ¶52; EX-2025 3-4; *see also* EX-1004, 1. Specifically, jojoba wax esters are monoesters (i.e. having one ester group), with two long carbon chains on either side of the ester, each chain containing between 18 and 24 carbons (predominantly 20 and 22 carbons) and a carbon-carbon double bond located between the ninth and tenth carbon positions from the ends of each chain (i.e. the C9 carbon):



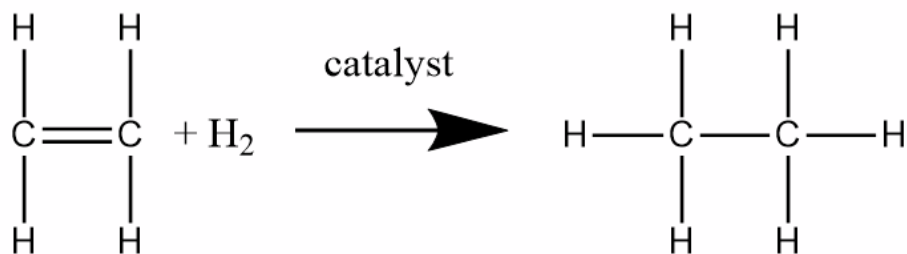
Jojoba Oil Structure.

EX-2009, ¶53; EX-1010, 2:51-54. These chains are much longer than the typical fatty acid chains in triglycerides. Additionally, in contrast to “typical plant oils,” where double bonds are “usually close to each other,” in jojoba wax esters the double bonds “are far apart and uneven from the center.” EX-2025, 9; EX-2009, ¶53.

A fatty acid chain can be saturated (no carbon-carbon double bonds), monounsaturated (a single carbon-carbon double bond), or polyunsaturated (multiple carbon-carbon double bonds). In general, the more carbon-carbon double bonds in a fatty acid chain, the lower that fatty acid chain’s oxidative

stability tends to be, because carbon-carbon double bonds are susceptible to oxidation. EX-2009, ¶55. A fully saturated fatty acid chain, meaning one that contains no carbon-carbon double bonds, is much less prone to oxidation and is therefore more stable.

The saturation of a fatty acid chain can be increased through hydrogenation. A hydrogenation reaction involves the chemical addition of two hydrogen atoms to a carbon-carbon double bond, thus converting the “unsaturated” double bond into a “saturated” single bond, as shown below:



EX-2009, ¶ 57; *see also* EX-2025, 10. Notably, hydrogenation results in a product with *fewer* double bonds.

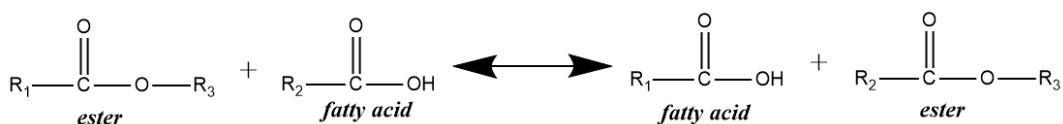
C. Transesterification of Wax Esters and Triglycerides

Triglycerides and wax esters like jojoba oil can also be modified through interesterification / transesterification¹. EX-2025, 10-11. Transesterification is a reaction in which one ester is converted into a different ester by exchanging the functional groups of the starting ester with an organic group from another reactant. EX-2009, ¶59. The general term “transesterification” encompasses three different types of reactions: acidolysis, alcoholysis, and interesterification (also known as an ester-ester exchange), shown below:

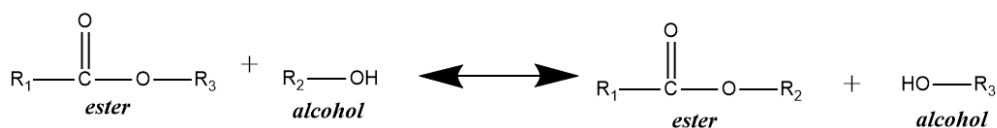
¹ The terms “interesterifying” and “transesterifying” are often used interchangeably in the art and will be used interchangeably herein unless otherwise noted. EX-2009, ¶58.

Transesterification

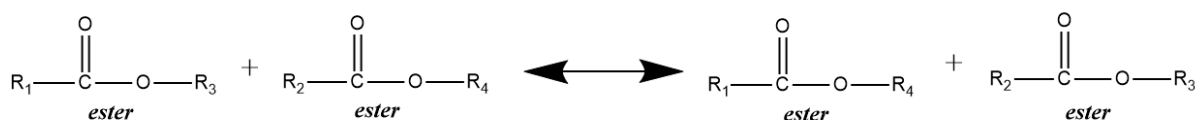
Acidolysis reaction



Alcoholysis reaction



Ester-ester exchange reaction



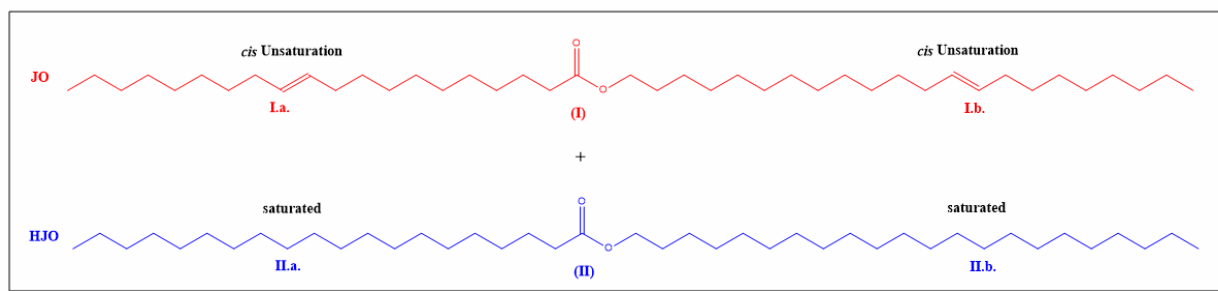
Adapted from EX-2028, 5.

In an acidolysis reaction, a fatty acid chain (R2-COOH) is reacted with an ester, creating a new ester compound and a new free fatty acid reaction product. EX-2009, ¶59. Similarly, in an alcoholysis reaction, an alcohol (R2-OH) is reacted with an ester, creating a new ester compound and a new alcohol. *Id.* Notably, both the free fatty acid and the alcohol reaction products are generally undesirable and therefore removed from the ester product in later processing steps. EX-2009, ¶60. The choice of reactants and the removal of the undesirable reaction products in alcoholysis and acidolysis reactions often leads to products that are more saturated (i.e. have fewer double bonds). *Id.* In an ester-ester exchange, a first ester (R1-COO-R3) is reacted with a second ester (R2-COO-R4) such that the chains on either side of each ester are swapped with one another. EX-2009, ¶61; EX-1014,

6. However, in contrast to the acidolysis and alcoholysis reactions, the ester-ester exchange generally does not require the removal of any reaction products. EX-2009, ¶61. The claims of the '245 Patent are specifically directed to ester-ester exchanges. *See* EX-1001, cl. 1; EX-2009, ¶61; EX-2046, 20:20-23:12.

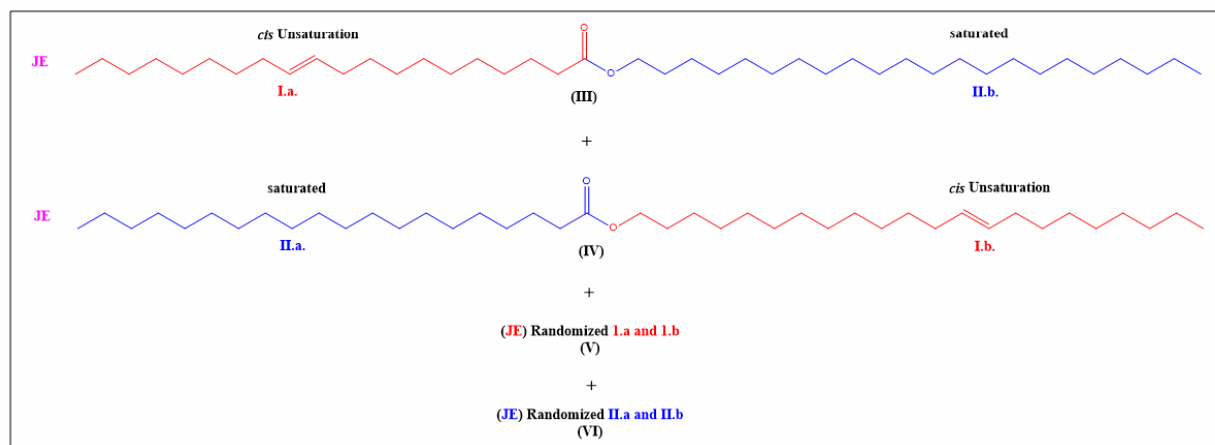
During ester-ester exchange, the combination of chains is randomized, as shown in the example below:

FEEDSTOCK



Sodium Methylate
Catalyst

TRANSESTERIFIED PRODUCTS



Jojoba Esters Contain No *trans* Isomers

EX-1014, 6. The product of the ester-ester exchange between saturated and unsaturated jojoba oil is a randomized mixture of saturated jojoba oil (II.a and II.b,

above), the two monounsaturated jojoba oil species (I.a and II.b; II.a and I.b), and fully unsaturated jojoba oil (I.a and I.b).

In an ester-ester exchange of triglycerides, the three fatty acid chains can be exchanged, not only on the same glycerol backbone, but also with fatty acid chains on other glycerol backbones in the same mixture. EX-2009, ¶63. Notably, as discussed above, because ester-ester exchanges do not require any reaction products to be removed, performing ester-ester exchange ***does not*** change the number of double bonds present before and after the reaction. Instead, an ester-ester exchange “only alters the distribution of the fatty acids over the triacylglycerols,” and “[t]he stability of the oil remains essentially unchanged[.]” EX-2009, ¶61; EX-2030, 1232.

D. Prior Art Catalysts for Transesterification

Transesterification requires a catalyst to initiate the reaction. *See* EX-2009, ¶64; EX-2030, 1233. Transesterification can be catalyzed by the addition of an acid or base catalyst but can also be catalyzed with an enzyme catalyst. EX-2009, ¶64; EX-2031, Abstract; EX-2032, Abstract. While chemical catalysts were known for use with both triglycerides and jojoba oil, enzymatic catalysts such as lipases were understood in the art at the time of the invention to be specific to triglycerides. EX-2009, ¶64; EX-2033, 1; EX-2035, 10.

1. Chemical Catalysts for Transesterifying Triglycerides and Jojoba Wax Esters

Conventional catalysts used in the prior art primarily include base catalysts such as alkali metals (sodium, potassium and their alloys) and the corresponding alcoholates (sodium methyllate and ethyllate) as well as acidic bentonite-type clay. *See* EX-2009, ¶65; EX-2030, 1233; *see also* EX-1001, 3:53-4:1.

A chemical catalyst works by attacking the carbon attached to the two oxygens in an ester bond, creating an ionized active catalyst on the ester that can attack another carbon attached to two oxygens on a different ester, leading to the exchange of their carbon chains. EX-2009, ¶66; EX-2030, 5. Chemical catalysts are aggressive reactants and generally act non-specifically on any available ester bond. EX-2009, ¶66.

When chemical catalysts are used for transesterification, byproducts are created, including, for example, methyl or ethyl esters or free fatty acids. EX-2030, 5; *see also* EX-1001, 4:1-6, 7:24-32. These byproducts can also react with and degrade other compounds present in the mixture, such as sterols or antioxidants. EX-1001, 7:32-45. These byproducts are generally removed in later processing steps.

2. Enzymatic Catalysts for Transesterifying Triglycerides

At the time of the invention, lipases, were also known to be able to catalyze transesterification reactions in triglycerides. EX-2009, ¶64; EX-2033, 1; EX-2035,

10. While there are three different kinds of lipases—i.e., *sn*-1,3 lipases, non-specific lipases, and fatty acid-specific lipases, all of these lipases were believed to require the glycerol backbone of the triglyceride to successfully catalyze a transesterification reaction. EX-2009, ¶74; EX-2033, 7.

The active site of all lipases, i.e., where the triglyceride binds and the transesterification reaction occurs, contains three amino acid residues that form a “catalytic triad” that is designed to specifically bind to two of the three oxygen atoms found in the glycerol head of a triglyceride. EX-2009, ¶79; EX-2035, 3. The binding of the two oxygens creates an “oxyanion hole” that stabilizes the triglyceride in a “tetrahedral intermediate” such that the ester-ester exchange can occur. EX-2009, ¶79; EX-2035, 3. A beta sheet on the exterior of the lipase (i.e., not in the active site) also stabilizes the triglyceride by binding carbons in the fatty acid chains of the triglyceride. EX-2009, ¶80; EX-2035, 3. Additionally, lipases can have different geometries, such as crevice-like, funnel-like, or tunnel-like, that can change the length of the binding site and affect how the triglyceride structure interacts with the lipase. EX-2009, ¶81; EX-2028, 12-13; EX-2063, 1, 8.

Because lipases specifically interact with the glycerol backbone of a triglyceride, a person of ordinary skill in the art would not have expected a jojoba wax ester that ***lacks*** that glycerol backbone, to be able to bind to a lipase’s active site. EX-2009, ¶83-85; EX-2063, Fig. 1; EX-2028, 15; EX-2035, 2. Moreover,

even if the jojoba wax ester somehow interacted with the lipase, a person of skill in the art would not have expected an ester-ester exchange to in fact be accomplished, given the lack of the glycerol backbone. EX-2009, ¶¶83-85; EX-2063, Fig. 1; EX-2028, 15; EX-2035, 2.

Prior to the filing of the '245 Patent, no literature described any attempts to transesterify anything other than triglycerides with a lipase, let alone a structurally dissimilar compound like jojoba wax esters. EX-2009, ¶¶76-77. There were certainly no disclosures of successful transesterification of jojoba wax esters with lipase. EX-2009, ¶122. Nor does the literature describe, even today, a mechanism of action or other explanation for how it is that jojoba wax esters actually undergo transesterification with a lipase catalyst. *Id.* Using a lipase to transesterify jojoba wax esters was therefore novel and non-obvious at the time of the invention. That a lipase-catalyzed transesterification of jojoba wax esters could lead, *inter alia*, to product improvements, such as the increased OSI, was also entirely unexpected.

III. THE '245 PATENT AND RELATED PROSECUTION HISTORY

A. The Claimed Invention of the '245 Patent

The '245 Patent described for the first-time methods and experimental results demonstrating that jojoba wax esters could be successfully transesterified using a lipase. EX-1001, 1:22-28; EX-2009, ¶76.

The '245 Patent discloses numerous unexpected and surprising results when an enzyme catalyst is used instead of a chemical catalyst, including improvements in OSI, viscosity, and performance. EX-2009, ¶90. First, the '245 Patent compares chemical and enzymatic ester-ester exchange by applying both processes to refined jojoba oil *Id.*, 8:41-67 (Example 1). The results of the ester-ester exchange are shown in Table 3:

TABLE 3

	Feedstock Composition	Chemical Catalyst	% Change	Enzyme Catalyst	% Change
<u>Components</u>					
Tocopherols	0.04%	0.00%	-0.04%	0.04%	0.00%
Fatty Acid	0.00%	3.10%	3.10%	0.00%	0.00%
Methyl					
Esters					
Free Fatty	0.00%	1.80%	1.80%	0.00%	0.00%
Alcohols					
OSI (hours)	26.5	21.5	-18.87%	38.6	45.66%
Wax Ester	98.00%	93.10%	-4.90%	98.00%	0.00%
Content					
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%

As shown in Table 3, the original feedstock had an oxidative stability (OSI) of 26.5 hours. *Id.*, 9:26-47; EX-2009, ¶91. When chemically transesterified, the OSI of the product dropped by ~20% to 21.5 hours. EX-2009, ¶91. The '245 Patent notes that the chemically catalyzed reaction “destroys the original amount of tocopherols present in the feedstock, which reduces the OSI of the transesterified product.” *Id.*,

9:53-56; EX-2009, ¶91. Additionally, fatty acid methyl ester and free fatty acid byproducts are formed through chemical transesterification. *Id.*, 9:49-53; EX-2009, ¶91. On the other hand, when the feedstock was transesterified using a lipase, the OSI of the product increased by 45% to 38.6 hours—a surprising result that cannot be explained simply by the preservation of natural tocopherols. *Id.*, 9:26-47; *see also id.*, 9:58-62 (“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.”); EX-2009, ¶91. This surprising result was repeated in a second experiment that used a continuous flow reactor rather than a batch reactor. *See id.*, 11:38-12:24; *id.*, 12:18-20; EX-2009, ¶91.

In addition to the unexpected increase in OSI, the '245 Patent demonstrates that the enzymatically transesterified product is superior to the chemically transesterified product. EX-2009, ¶92. Both wax ester products were tested for their performance in a “typical cream formulation” shown in Table 4, with all components kept the same apart from the transesterified product. *See id.*, 10:5-67; EX-2009, ¶92. Surprisingly, the enzymatically transesterified product created a cream formulation that “had a viscosity drop of nearly 35%” from the viscosity of the formulation prepared with the chemically transesterified product. *Id.*, 11:17-29; EX-2009, ¶92. Further, the '245 Patent noted a significant difference in the

creams' appearance, with the cream derived from chemical transesterification having a "[w]hite, semi-solid phase" appearance, while the cream derived from enzymatic transesterification had a "[w]hite, liquid phase, glossy" appearance. *Id.*, 11:17-24; 12:20-24; EX-2009, ¶92.

The '245 Patent also discusses unexpected differences between using a lipase on triglycerides and using a lipase on jojoba wax esters. EX-2009, ¶95. As described above, it was unexpected at the time of the invention that a lipase would work at all on jojoba wax esters due to their lack of a glycerol backbone. *See* Section II(D)(2), *supra*; EX-2009, ¶95. More unexpected still was that jojoba wax esters could be transesterified by different kinds of lipases, including both *sn*-1,3 specific lipases and non-specific lipases—what the '245 Patent describes as "lipases that operate using insertion of a triglyceride." *Id.*, 14:38-40; EX-2009, ¶95. The '245 Patent notes that "[t]his result is unexpected, as these lipases sterically interact quite differently with the molecules they are involved in catalyzing." *Id.*, 14:40-42; *see also id.*, 14:51-54 ("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."); EX-2009, ¶95.

In addition to discovering that lipases unexpectedly worked with jojoba wax esters, the inventors also discovered that enzymatic transesterification of jojoba

wax esters as compared to enzymatic transesterification of triglycerides generates significantly greater production volumes. EX-2009, ¶96. While “conventional processing of triglycerides” with lipases “typically yields up to 4000 kg of product per kg of catalyst,” when lipases were used with jojoba wax esters, “a kg of product to kg of catalyst ratio of 5011” could be achieved, that is, “over 20% greater than the ratio when the same lipase is used for triglyceride production.” *Id.*, 14:55-15:8; EX-2009, ¶96. This result “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.” *Id.*, 15:8-12; EX-2009, ¶96.

These unexpected results, achieved using a novel lipase-based process to enzymatically transesterify jojoba wax esters, further illustrate the non-obviousness of the claimed invention. EX-2009, ¶97.

B. The Prosecution History of the '245 Patent

The application that issued as the '245 Patent was filed on December 19, 2014, and underwent extensive prosecution over a nearly eight-year period, involving over one hundred prior art references and eight separate rejections using eleven different references. Additionally, the Examiner considered four different declarations submitted by first named inventor, Jeff Addy, to support the unexpected results demonstrated in the specification.

The Examiner issued multiple rejections over prior art that disclosed lipase-catalyzed alcoholysis reactions in triglycerides. These rejections relied on the premise that the “OSI of the trans-esterified product being greater than an OSI of the feedstock is a property that would necessarily be presented in the process as taught by [the prior art] because the prior art method steps are the same as recited in the instant claims.” EX-1002, Pt. 2, 425; *see also id.*, 426-427; *id.*, Pt. 3, 555; *id.*, Pt. 4, 766, 814, 972-973; *id.*, Pt. 5, 1035, 1123-1124. In other words, the Examiner argued that enzymatic transesterification inherently results in a transesterified product with an OSI greater than the OSI of the feedstock.

What the Examiner did not appreciate about these references until the end of prosecution, however, was two-fold: first, that a distinction existed between alcoholysis transesterification and the ester-ester exchange transesterification required by the claims, and second, that even in alcoholysis transesterifications, OSI of the product was not always greater than the OSI of the feedstock. EX-2009, ¶104.

Most of the prior art that formed the basis of the rejections used an alcoholysis transesterification, rather than an ester-ester exchange. As discussed above, in an alcoholysis reaction, an alcohol is reacted with an ester such that the fatty acid chain attached to the alcohol is swapped with one of the ester’s side chains. *See* Section II(C), *supra*; EX-2009, ¶59. The resulting unwanted

byproduct with the alcohol attached to the ester's lost side chain, is generally removed in a later process step from the desired ester product. EX-2009, ¶60. As such, alcoholysis can be used to remove side chains that are unsaturated or partially unsaturated (i.e. have double bonds) and replace them with saturated chains. Removing chains with double bonds would generally have been expected to improve the OSI of the oil by reducing the number of double bonds in the product susceptible to oxidation. *Id.* In other words, when used in the context of removing unsaturated or partially unsaturated side chains of an ester reactant, alcoholysis generally would have been expected to reduce the amount of unsaturation in the ester product. *Id.*

But even in an alcoholysis reaction, different results could be achieved. During prosecution, inventor Jeff Addy replicated two alcoholysis reactions from the prior art and compared the results using jojoba oil with those of a triglyceride-based oil. First, Addy replicated the protocol disclosed in Steinke. EX-2045. Steinke used lipase-catalyzed alcoholysis on crambe oil and camelina oil but disclosed no oxidative stability data. EX-2009, ¶106. Addy replicated Steinke's protocol using crambe oil and jojoba oil, noting that both of these materials have similar qualitative properties, including "iodine values between 65-67" and "similar oxidative parameters in [peroxide value] and [anisidine value] prior to the reaction." EX-1002, Pt. 2, 469. Given these similarities, Addy stated that "one

would expect the OSI of the crambe and jojoba derivatives be close if not identical.” *Id.*, 470.

But when Addy tested the OSI of the feedstocks and transesterified products from Steinke’s alcoholysis method, he surprisingly found a significantly different result between jojoba oil and crambe oil. EX-2009, ¶107. While jojoba oil had over a three-fold increase in OSI, crambe oil had an insignificant increase of only about an hour:

OSI (hours)	1	2	3	Avg.	+/-
Jojoba Pre-Reaction	15.825	18.176	18.484	17.495	1.455
Jojoba Post Reaction	65.075	68.875	67.775	67.242	1.955
% Change	411%	379%	367%	384%	23%

Crambe Pre-Reaction	1.191	1.134	1.765	1.363	0.349
Crambe Post Reaction	2.537	1.990	2.635	2.388	0.348
% Change	213%	176%	149%	175%	32%

EX-1002, 467-468. Addy explained a one hour difference in OSI is within the margin of testing error and was therefore not significant. *Id.*, 469. Addy concluded that using Steinke’s method did not always result in transesterified products with improved OSI over the feedstock, and thus whether a particular “feedstock material will demonstrate the OSI increase following enzymatic transesterification reaction is not predictable using these common parameters.” *Id.*, 470. The Examiner subsequently withdrew the rejections over Steinke.

The unpredictability of enzymatic transterification was further supported by another declaration that Addy submitted that replicated a method from Gunawan.

Id., Pt. 3, 554-558; *id.*, Pt. 2, 426-427; EX-2045. Just as with Steinke, Addy replicated Gunawan's lipase-catalyzed alcoholysis reaction using jojoba oil and sunflower oil, a common triglyceride-based oil. *See* EX-1002, Pt. 4, 838-843. Surprisingly, Addy found that while the OSI of the transesterified sunflower oil (Experiment 1) increased slightly over the OSI of the feedstock, transesterified jojoba oil (Experiment 2) had the opposite result, demonstrating decreased OSI compared to the feedstock:

	Experiment 1	Experiment 2
Reactants OSI (hrs)	5.8	24.0
Products OSI (hrs)	7.0	18.0
Δ %	20.7	-25.0

Table 4. Oxidative Stability Index of Experiments 1 & 2

Id., 841. Thus, Addy concluded that “the observed failure of the method of Gunawan to produce a product with a higher OSI when jojoba oil was used as the feedstock demonstrates that, in my opinion, it would be impossible for a person of ordinary skill reading Gunawan to have had any ability to predict this effect.” *Id.*, 842. Together, Addy's experiments replicating the prior art demonstrate that, even with an alcoholysis transesterification, a POSITA would not have expected OSI of transesterified products to necessarily increase relative to the feedstock. EX-2009, ¶108. It is also worth noting that neither of these prior art documents in fact taught the use of a lipase to transesterify a wax ester rather than a triglyceride. *Id.*

During an applicant-initiated interview, the Examiner ultimately found that these arguments were “persuasive because the declaration filed on 07/20/2021 shows that the enzymatic transesterification of jojoba oil feedstock with a lipase results in significantly higher OSI *even without the addition of an alcohol.*” EX-1002, Pt. 5, 1167 (emphasis added). The Examiner withdrew the pending obviousness rejection and allowed the claims. In the Notice of Allowance, the Examiner specifically found the claims non-obvious over the prior art because of the unexpected result that increased OSI could be achieved without the addition of an alcohol:

[T]he prior art is silent about the OSI of the transesterified product and teaches transesterification of the feedstock with a lipase with the addition of an alcohol to the feedstock. The instant method wherein a feedstock comprising jojoba wax esters and hydrogenated jojoba wax esters is enzymatically transesterified with a lipase *results in an unexpected higher OSI of the transesterified product* as compared to the OSI of the feedstock *even without the addition of an alcohol.*

Id., 1178 (emphasis added). In other words, it was unexpected that the OSI of the product could be higher than the OSI of the feedstock with the claimed lipase-based ester-ester exchange rather than an alcoholysis reaction.

IV. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) would have had at least a B.S. in Chemical Engineering, Chemistry, or a related field, and three years of work experience working in the specialty chemicals industry, including in the

beauty, personal care, home care, food, or environmental chemical industries or in other specialty chemical industry areas. EX-2009, ¶41. Less work experience may be compensated by a higher level of education and vice versa. *Id.*

V. CLAIM CONSTRUCTION

The district court issued a claim construction memo and order in the parallel proceeding in the District of Delaware. *See* EX-2006, 1; *see also generally* EX-2003. Given the arguments before the Board at this time, it is not currently necessary to resolve the issues related to claim construction. Patent Owner reserves the right to address any construction proposed by Vantage or the Board.

VI. CLAIMS 1, 2, 3, AND 5 ARE PATENTABLE OVER GROUND 1

Vantage's Ground 1 fails to prove unpatentability of claim 1 because the Ground 1 prior art fails to disclose (i) contacting a jojoba wax ester feedstock with a lipase, (ii) the OSI of the feedstock, (iii) increased OSI in the transesterified product compared to the feedstock, and (iv) the use of 20-50% hydrogenated wax ester in the feedstock. EX-2009, ¶¶112-161. Ground 1 also fails to disclose the limitations of the dependent claims. *Id.*

A. Neither Cummings, Xu, Nor Sessa Discloses “Contacting the [Jojoba Wax Ester] Feedstock with a Lipase”

Claim 1 requires “contacting the feedstock with a lipase,” where the “feedstock” “compris[es] jojoba wax esters and hydrogenated jojoba wax esters.” EX-1001, cl. 1. It is undisputed that neither Cummings nor Sessa discloses using a

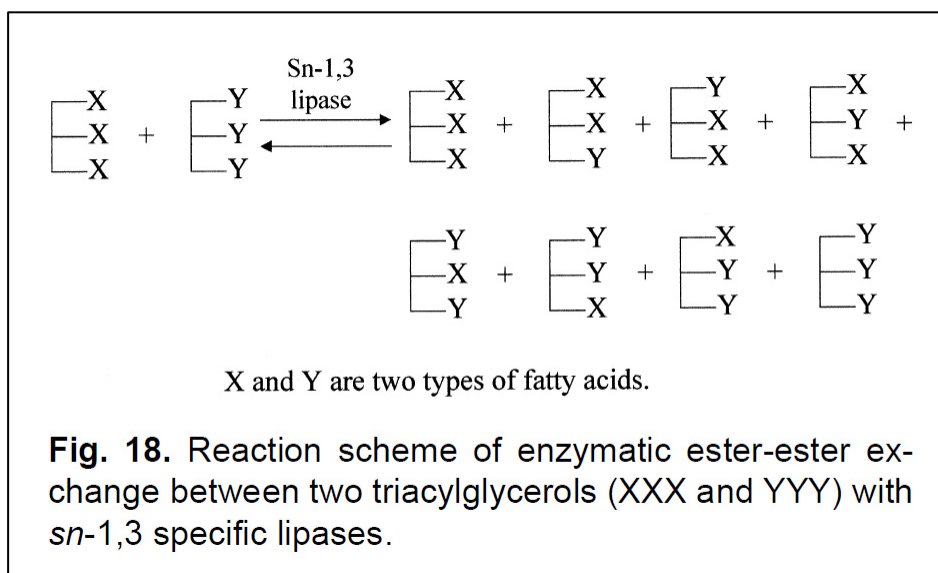
lipase to interesterify jojoba wax esters. EX-2046, 31:24-32:9, 59:17-19; EX-2047, 2; EX-2009, ¶113. And it is undisputed that Xu provides no examples of using a lipase with jojoba wax esters. EX-2046, 56:10-57:19. Vantage instead argues that a “POSA would have found it obvious to modify the catalyzed process of Cummings to use the lipase disclosed in Xu as the catalyst.” Pet., 36. But Cummings does not motivate a POSITA to make a such a change as no disadvantage or problem is identified. Further, Vantage does not cite a single piece of prior art that discloses, contemplates, or suggests using a lipase to transesterify jojoba wax esters, as all of the references, including Xu, only disclose transesterifying triglycerides. EX-2009, ¶113.

Contrary to any actual motivation, critical structural differences, namely the absence of a glycerol backbone in jojoba wax esters, would have counseled a POSITA against using a lipase with jojoba oil. EX-2009, ¶114. Vantage never addresses why a POSITA would have sought to modify Cummings or expected a lipase-catalyzed ester-ester exchange to work on jojoba wax esters. *Id.* This failure of proof infects Vantage’s entire Petition, and precludes a finding of unpatentability. *Id.*

1. Vantage's Prior Art Only Discloses Lipase-Catalyzed Transesterification of Triglycerides

In Ground 1, Vantage relies solely on Xu to disclose the use of a lipase to catalyze a transesterification reaction. But Xu never teaches or even suggests the use of a lipase with anything other than a glyceride-based molecule. EX-2009, ¶¶115-118.

Xu is a review article describing multiple ways in which lipase-based reactions have been utilized to modify the triglyceride structure. Xu describes, in a single section, the lipase-based ester-ester exchange in triglycerides *only*. See EX-1008, 10-13. The reaction scheme Xu describes and illustrates in Figure 18 shows the ester-ester exchange of triglyceride chains using a *sn*-1,3 lipase:



EX-1008, Fig. 18.

Xu explains in detail how lipases work on the specific triglyceride structure by exchanging *sn*-1,3 chains and maintaining the *sn*-2 chain. *Id.*, 11; *see also id.* (“The equations for the calculation of different types of **TAG** [triacylglycerol] species are listed below”); *id.*, 12 (“The formed DAG [diacylglycerol] can esterify with another FFA [free fatty acid] **to form a new TAG**”); *id.*, 13 (“Ester-ester exchange can also be used for the **production of structured TAGs** with the reaction between TAGs and fatty acid ethyl esters.”). A POSITA reading Xu would not find any explanation of how a lipase meant for use on a triglyceride could or would have been able to similarly act in an ester-ester exchange on a different structure lacking a glycerol backbone, such as jojoba wax esters. EX-2009, ¶¶117-118. A POSITA would have understood that lipases have high specificity in acting on triglyceride substrates. EX-2009, ¶117 (citing EX-2039, Abstract; EX-2028, 6). Nothing in Xu suggests that lipases could work on substrates like jojoba wax esters, which are not triglycerides and do not contain *any* form of a glycerol. Silence does not support a finding of motivation to combine here. *Id.* Simply put, there is nothing in Xu or Cummings that would motivate a POSITA to consider utilizing a triglyceride specific lipases to modify jojoba wax esters. *Id.*

2. Vantage Never Addresses the Structural Differences Between Triglycerides and Jojoba Oil

Despite the well-known differences in chemical structures of triglycerides compared to jojoba wax esters, including the presence/absence of a glycerol backbone, positioning of the fatty acid chains relative to the ester, and number of the fatty acid chains, Vantage did not acknowledge these differences or address the impact of these differences on lipase activity. EX-2009, ¶¶119-122.

As explained above, jojoba wax esters have two long chains extending to either side of a single ester group, as opposed to the three fatty acid chains coupled through three ester groups to a glycerol backbone in a triglyceride. *See supra* §II(B); EX-2009, ¶120. Unlike jojoba oil, the triglyceride's alcohol moiety is significantly smaller and has three -OH groups that can be involved in an ester-ester exchange. Such structural differences would have been understood by a POSITA to hinder the jojoba wax ester's ability to move or position themselves to bind with the catalytic domain of the lipase binding sites. EX-2009, ¶120 (citing EX-2035, 2-3). A POSITA would not have expected a lipase to be able to bind to the single ester bond in jojoba wax esters. *Id.*

Although it was well known that lipases act on triglycerides with specificity, Vantage did not address why a POSITA would have understood Xu's disclosure of lipase catalyzation of ester-ester exchanges in triglycerides to be applicable to

jojoba wax esters. EX-2009, ¶121. A POSITA would have been aware of the specificity of lipase binding sites based on the size and shape of those binding sites and would have been aware of the differences in structures between triglycerides and jojoba wax esters. EX-2009, ¶121 (citing EX-2063, Fig. 1, 8-10). It would not have been obvious to a POSITA that the lipase binding sites that were known to attach specifically to the glycerol backbone (i.e., the catalytic triad and oxyanion hole) at the start of an ester-ester exchange would work when exposed to molecules *lacking* that glycerol backbone. *Id.* Vantage provides no prior art showing why a POSITA would have believed a triglyceride-specific lipase would work with jojoba wax esters.

Given the structural differences between jojoba oil and triglycerides, a POSITA would not have had a reasonable expectation that a lipase-catalyzed ester-ester exchange of jojoba wax esters would be successful, and therefore would not have been motivated to try the same. EX-2009, ¶122. Despite Xu being published a decade before the '245 Patent, and specifically stating that enzymatic transformation of triglycerides had been known for the previous 20 years, the only scientific data anywhere in the record showing the actual results of lipase-catalyzed transesterification of jojoba wax esters is in the specification and prosecution history of the '245 Patent. Put simply, for over 30 years no one knew that lipases could transesterify jojoba wax esters until the inventors of the '245 Patent showed

it. Clearly, the POSITA was not motivated over those three decades to attempt the enzymatic transesterification of jojoba wax esters and any contrary suggestion today is hindsight. *Id.*

Vantage's failure to address the structural differences between triglycerides and jojoba oil may be explained to some extent by Vantage's choice of expert. In addition to having no experience in the personal care products industry or with formulating personal care products, Dr. Rockstraw also lacked lipase chemistry knowledge, as well as knowledge of triglyceride structures. At his deposition, Dr. Rockstraw argued that using an enzyme on a triglyceride discloses the use of an enzyme on jojoba wax esters because "[i]t's in the same category of chemical reactions, so inherently it discloses that, yes." EX-2046, 35:11-19; *see also id.*, 69:9-17 ("something that works on triglycerides is more than likely to work also on other fats and oils."). But as Dr. Schultz and the literature make clear, jojoba wax esters and triglycerides are not similar compounds and would not be expected to be interchangeable.

Additionally, Dr. Rockstraw could not answer even the most basic questions related to lipase reactions and lipase-related mechanisms. For example, Dr. Rockstraw was unable to answer whether jojoba wax esters have the *sn*-1, 3 structure that a *sn*-1,3 lipase acts upon, despite this structure being critical to the interesterification taught in Xu. In fact, he was not even able to explain what the

term “*sn*-1,3” referred to. *See* EX-2046, 57:20-58:6. A straightforward comparison of the structure of jojoba wax esters to triglycerides shows that jojoba wax esters plainly lack the *sn*-1,3 structure found in every triglyceride. EX-2009, ¶¶48, 53. Dr. Rockstraw was also unable to answer any questions about the mechanism of action of lipases, and admitted he had not even “studied triglyceride reactions with regard to this matter.” EX-2046, 98:22-99:12.

Dr. Rockstraw’s lack of knowledge led him to conclusions driven only by hindsight. For example, when asked “[w]ould you expect the lipase to work if there is not a glycerol backbone?,” Dr. Rockstraw responded “[w]ell there is not a glycerol backbone in jojoba oil, and it works to transesterify those, so I guess the answer is yes, I expect it to work.” EX-2046, 94:2-9; *see also id.*, 35:11-25, 69:9-17. This response is classic hindsight. *See ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012) (rejecting expert testimony “fraught with hindsight bias” where testimony was “essentially a conclusory statement” that a skilled artisan “would have known, based on the ‘modular’ nature of the claimed components, how to combine any of a number of references to achieve the claimed inventions”).

B. Cummings Does Not Disclose “OSI of the Feedstock”

Claim 1 requires a “feedstock” that “compris[es] jojoba wax esters and hydrogenated jojoba wax esters.” EX-1001, cl. 1. As the Board correctly found,

Cummings’ “refined jojoba oil” forms only “part of” the feedstock, meaning the unsaturated part of the feedstock, and Vantage failed to identify where Cummings discloses an OSI value of a feedstock mixture containing both the saturated and unsaturated parts. I.D., 24 (citing Pet., 38). As such, the Board found that “Petitioner does not identify clearly where Cummings discloses an OSI value of the fully saturated jojoba oil that forms the *other* part of the feedstock, much less the OSI of a feedstock mixture containing both the saturated and unsaturated parts.” *Id.* (emphasis in original); *see also id.*, 28 (“[W]e are skeptical that Cummings alone discloses limitation 1[c][.]”).

Cummings is a sparsely detailed marketing document discussing commercial products. Vantage relies on the single statement in Cummings that “[j]ojoba esters demonstrate remarkable stability with OSI values of all jojoba esters greater than 100 hours and as high as 675 hours ... the OSI of refined jojoba is around 35 hours.” EX-1004, 2; *see also* Pet., 38. But as the Board noted, the refined jojoba oil is only one of the two required components of the claimed feedstock, and also fails to account for the contributions of both components of the feedstock (jojoba wax esters and hydrogenated jojoba wax esters) to the OSI. EX-2009, ¶¶123-125. Cummings describes OSI values for commercial jojoba ester products and refined jojoba oil, but does not include an OSI value for a feedstock containing both jojoba

wax esters and hydrogenated jojoba wax esters. EX-2009, ¶¶124 (citing EX-1004, 2).

To the extent Vantage alleges that the OSI of the feedstock is dictated solely by the OSI of the unsaturated jojoba wax esters, as Dr. Rockstraw alleged on redirect at his deposition, (EX-2046, 139:23-141:16, 142:7-143:16), and is therefore 35 hours (i.e. the same as refined jojoba oil), Vantage's Petition cites no evidence supporting that allegation, and this position is unsupported by the literature. EX-2009, ¶¶125-128. At a high level, the method used to measure OSI depends on the particular composition of the sample and the concentration of the materials being oxidized, i.e., the number of double bonds present in the total mass of a given sample. Thus, it is the number of double bonds available for reaction with oxygen (relative to the total number bonds / or relative to the total composition) that influences the OSI. EX-2009, ¶¶125-128 (citing EX-2002, 5; EX-1006, 2-3; *see also* EX-1014, 6, 7; EX-1004, 2; *see also* EX-2048, 15). When saturated wax esters are present in a mixture, the relative number of double bonds necessarily goes down, when compared against an equivalent amount of pure unsaturated jojoba wax esters. Therefore, as the percentage of saturated wax esters increases, the OSI value will increase. Ultimately, the OSI is specific for any mixture, and one is mistaken to conclude that because a mixture contains one

component its OSI would be the same at all concentrations of that component.

Cummings plainly does not disclose the OSI value of the feedstock mixture. *Id.*

C. Vantage's Prior Art Does Not Disclose the Required Comparison of OSI Values

Claim 1 requires that an “(OSI) of the transesterified product is greater than an OSI of the feedstock.” EX-1001, cl. 1. Because Vantage's Petition does not identify an OSI value of a feedstock mixture in Cummings containing both saturated and unsaturated jojoba wax esters, the Board could not determine whether the asserted prior art in fact disclosed the comparison required by the claim between the OSI values of the product and the two-component feedstock. EX-2009, ¶129.

Instead, the Board relied on three of Vantage's background references to support its conclusion that “through transesterification, the OSI of the resulting product could be improved” by “routine optimization[.]” I.D., 26. This argument fails because the Board did not fully appreciate that the claims do not just require improved OSI in the product, but rather an improvement *in comparison to the feedstock*. EX-2009, ¶130.

Upon examination, each background reference has the same deficiency as Cummings. None of the references includes enough information to compare the OSI of the product to the OSI of the feedstock, let alone to conclude that the OSI

of the product was higher than that of the feedstock. Vantage relies on the references' disclosures that allege the OSI of the product is higher than the unmodified oil to infer that the product OSI value is higher than that of the feedstock containing both the unmodified oil *and* the hydrogenated esters. But nothing in the record supports that inference. EX-2009, ¶¶129-137.

Saturated wax esters are known to have high oxidative stability. EX-2009, ¶132 (citing EX-1015, [0004] (“Saturated hydrocarbon based oils have no unsaturation and therefore have high oxidative stability.”)). In comparison, for instance, the Board found that Cummings disclosed that the refined jojoba oil forming the unsaturated part of the feedstock had an OSI value of “around 35 hours.” I.D., 24 (citing EX-1004, 2). Vantage has not shown what the oxidative stability would be of a feedstock containing 20-50% of fully hydrogenated wax esters, let alone whether transesterification would increase it even further. EX-2009, ¶132. None of Vantage's cited references or expert testimony fills this gap in proof. Furthermore, Vantage's references report only the OSI of a commercial jojoba wax ester product, from which undesired reaction products (e.g., alcohols and acids formed during chemical interesterification) have been removed and antioxidants (tocopherols) have been added. *Id.*

The Board cites Vantage's first background reference, Kodali, for the proposition that “[t]ransesterifying various short saturated fatty acid esters with

vegetable oil *improves oxidative stability ... due to the increased saturation and the heterogeneity* of the fatty acid esters to the polyols.” I.D., 26 (emphasis in original, citing EX-1015, [0005]). But the rest of that paragraph makes clear that the improved oxidative stability is in comparison to only the unmodified oil, and does not factor in the saturated portion of the feedstock. *See* EX-1015 [0005]. Additionally, in Kodali’s experimental results shown in Table 1, Kodali states that “[t]he oxidative stabilities of the transesterified products without added antioxidants were lower than the starting oil[.]” *Id.*, [0081]. Table 1 shows the OSI of the IMC-130/TMPH transesterified (TE) product is 17.90 hours, and the OSI of the IMC-130 “starting oil” is 38 hours. *Id.* The OSI of the feedstock—that is, the IMC-130/TMPH mixture before transesterification—is never given. *Id.* Thus, Kodali, which uses a chemical catalyst, is silent as to the oxidative stability of the feedstock, and no comparison can be made. EX-2009, ¶133.

The Board cites Vantage’s second background reference, Xu 2, for the statement that this “[c]onfirm[s] that enzymatic interesterification has advantages for the oxidative stability of the products.” I.D., 26 (citing EX-1017, 12). Here, the oxidative stability “advantages” are not in comparison to either the unmodified oil (here, “fat”) or the feedstock, but rather in comparison to products “made from chemically interesterified fat,” as opposed to enzymatically interesterified fat. EX-1017, 245. Like Kodali, Xu 2 is silent as to the oxidative stability of the feedstock.

Indeed, it is silent as to the oxidative stability of any specific component in the process. Thus, no conclusions can be drawn from Xu 2's statement in relation to the claimed comparison limitation. EX-2009, ¶134.

The Board cites Vantage's third background reference, Lopez-Hernandez, as "describing 'lipase-catalyzed interesterification' and noting the 'absence of unsaturated fatty acid residues implies that the products ... have enhanced stability with regard to oxidation processes.'" I.D., 27 (citing EX-1018, C371). But this statement in Lopez-Hernandez is nothing more than a basic statement of chemistry. The reaction in Lopez-Hernandez is an ester-ester exchange between two oils that both contain only saturated fatty acid residues. *See* EX-1018, 2. As discussed above in Section II(C), when no unsaturated residues (i.e., double bonds) are present, a fatty acid is at its most stable. Therefore, Lopez-Hernandez's comment about the "absence of unsaturated fatty acids" causing enhanced stability is simply a factual statement about the nature of the chosen oils. Lopez-Hernandez does not measure oxidative stability or OSI, and therefore no comparison of oxidative stability between the products and the feedstock is made. EX-2009, ¶133.

The Board also cites to two paragraphs from Dr. Rockstraw, to support its conclusion that the "totality of the argument and evidence cited by Petitioner is sufficient to meet the institution burden[.]" I.D., 27-28 (citing EX-1003, ¶¶122-123). But Dr. Rockstraw does not fill the missing gap. Paragraph 122 addresses

the disclosures in Cummings that the Board found did not disclose the OSI of the feedstock. EX-1003, ¶122. And paragraph 123 just repeats the same quotes from the references addressed above. *Id.*, ¶123. Dr. Rockstraw, like Vantage and the Board, focused on the contention that transesterification “can produce a product having improved—and thus greater—oxidative stability,” than the unmodified fat, oil, or wax ester. *Id.* Dr. Rockstraw never addresses whether the oxidative stability of the product is (or could have been expected to be) greater than that of the feedstock. EX-2009, ¶136.

None of Vantage’s cited art, whether used as a primary reference or as a background reference, support a finding that “it would have been obvious as a matter of routine optimization for a POSA to tailor the process to achieve” a transesterified product with OSI increased over the OSI of the feedstock. *I.D.*, 26; EX-2009, ¶137.

D. None of Vantage’s Prior Art or Background References Discloses Increasing OSI of the Feedstock Through Transesterification

In addition to failing to provide evidence showing the required comparison between the product and the feedstock, Vantage also fails because it does not explain why a POSITA would have expected OSI to *increase* in comparison to the feedstock after transesterification, as required by claim 1. *See* EX-1001, cl. 1. In fact, a POSITA would not have expected OSI to increase after transesterifying

jojoba oil, because the number of double bonds—i.e., the source of oxidative *instability*—does not change in the claimed ester-ester exchange. None of Vantage’s references say otherwise. Thus, Vantage has not met its burden to show any comparison, let alone that the results of such a comparison reveal an increased OSI in the transesterified product. EX-2009, ¶138.

1. Cummings Does Not Show Transesterification Increases OSI Compared to the Feedstock

Nothing in Cummings suggests that the *transesterification* of refined jojoba oil, with nothing more, results in an increased OSI of the Floraesters jojoba ester products compared to the feedstock. EX-2009, ¶139. Cummings is simply a marketing brochure for Floratech’s Floraesters products², not a peer-reviewed publication showing statistically supported data. In contrast, the ’245 Patent demonstrates conclusively that chemical transesterification—that is, how the Floraesters products were formulated at the time of Cummings’ publication—resulted in a product with *lower* OSI than the feedstock. EX-1001, 9:26-56. This

² It was and is standard industry practice in these types of publications not to use trade names, which is why the products are identified as “Jojoba Ester” rather than “Floraesters. EX-2009, ¶139. The first page of Cummings, however, identifies the Floraesters trade name. EX-1004, 1.

finding is also consistent with other prior art such as Kodali, which disclosed decreased OSI after chemical transesterification and required the addition of antioxidants to bring the OSI of the product back up. EX-1015, [0081].

A POSITA would instead have understood that ester products generally undergo additional processing after chemical transesterification. EX-2009, ¶140. Specifically, with jojoba wax esters, a POSITA would have understood that reaction impurities would be removed and additional antioxidants (e.g., tocopherols) would be added to increase OSI and enhance stability of the commercial product. It is the addition of tocopherols that explains why the OSI of refined jojoba oil is reported as 35 hours but the OSI of Floratech's Jojoba Esters 15 commercial product, which has the same number of double bonds as refined jojoba oil, is nevertheless reported as 100 hours (EX-1004, 2) or 70 hours (EX-1006, 3), respectively. EX-2009, ¶140. Indeed, Floratech's former Technical Director gave a 1998 presentation to the Society of Cosmetic Chemists, titled "Effects of Additives on the Oxidative Stability of Botanical Emollients," showing that the Floratech's Jojoba Esters 15 and Jojoba Esters 60 products referenced in Cummings and *Trans* Isomers 2 had added tocopherol. Compare EX-2048, 15 (Jojoba Esters 60 with tocopherol has OSI of ~225 hours; Jojoba Esters 15 with tocopherol has OSI of ~70 hours; Jojoba Esters 15 without tocopherol has OSI of ~35 hours), with EX-1006, 3 (Table 2).

The addition of tocopherols is further supported by certificates of analysis for the Floraesters 20 and Floraesters 15 products from the time period of Cummings and *Trans* Isomers 2. See EX-2013, 1 (2004 certificate disclosing 0.05 wt% tocopherols); EX-2012, 1 (same); EX-2014, 2, 7 [REDACTED]; [REDACTED]; EX-2049, 1, 2. Therefore, while the commercial product has a higher OSI than refined jojoba oil, that increase is attributable to the added tocopherol, not to transesterification. The disclosures in Cummings about the OSI of commercial products would not have led a POSITA to believe that simply transesterifying jojoba wax esters would result in an improved OSI, when no double bonds are being lost or gained. EX-2009, ¶141.

2. A POSITA Would Not Have Expected OSI to Increase After Ester-Ester Exchange

A POSITA would not have expected a meaningful change in oxidative stability of a transesterified product because the degree of saturation (i.e., the number of double bonds) does not change during ester-ester exchange. EX-2009, ¶142.

The claims of the '245 Patent require “transesterifying the jojoba wax esters and the hydrogenated jojoba wax esters in the feedstock with the lipase to form a transesterified product.” EX-1001, cl. 1. Thus, the transesterification step recited in the claims of the '245 Patent is an ester-ester exchange. EX-2009, ¶143; see

also EX-2046, 23:2-12 (Dr. Rockstraw agreeing the claims are directed to ester-ester exchange). As discussed above, jojoba wax esters are an unsaturated species with two double bonds (one on each end of the molecule). *See* Section II(B). Hydrogenated jojoba wax esters, on the other hand, are fully saturated and have zero double bonds. EX-2009, ¶143. In an ester-ester exchange between these two compounds, the fatty chains on either side of their ester bonds are swapped, randomizing the chains found in the mixture. Critically, the total number of double bonds in the mixture *stays the same* before and after the ester-ester exchange. *Id.*; *see also* EX-2046, 80:19-22 (Dr. Rockstraw agreeing the number of double bonds is the same in the feedstock and the product). As explained above, the number of double bonds in a compound is a key predictor of oxidative stability. Because there is no net gain or loss in double bonds in the claimed transesterification process, the POSITA would not have expected the oxidative stability to meaningfully change in the transesterified product. EX-2009, ¶143.

Other prior art references confirm this. For instance, Rozenaal³, a paper disclosing lipase-catalyzed ester-ester exchange of triglycerides, confirms that a

³ Rozenaal is the article that Vantage's Ground 3 prior art reference *Trans Isomers* 1 cites for the disclosure of using enzymes for interesterification. *See* EX-1005, 3.

POSITA would have expected no meaningful change in oxidative stability after an ester-ester exchange:

Interesterification is one of three important fat modification processes. Unlike hydrogenation, it leaves the fatty acid composition unchanged and only alters the distribution of the fatty acids over the triacylglycerols. ***The stability of the oil remains essentially unchanged***, but important physicochemical properties such as melting, crystallization and recrystallization behavior are modified.

EX-2030, 3 (emphasis added). Rozenaal explains that during an ester-ester exchange, “only” the distribution of the fatty acids is changed, with stability being “essentially unchanged.” *Id.*; see also EX-2009, ¶144. Interestingly, Dr.

Rockstraw admitted at his deposition that, while he looked for and found the Rozenaal reference, he did not cite it in his declaration “[b]ecause the content that I needed was in Trans 1,” for Ground 3. EX-2046, 36:2-12. Rozenaal’s acknowledgement that oil stability remains “essentially unchanged” is an independent reflection of what was actually known in the art, and flatly contradicts Dr. Rockstraw and Vantage’s argument that a POSITA would have somehow expected an ester-ester exchange to increase the oxidative stability of the product over the feedstock. Vantage cites no prior art to the contrary.

The background references that Vantage and the Board rely upon to support the contention that it was known that OSI could be improved through transesterification all change the number of double bonds in the product. This

shows that it was **not** the claimed transesterification that improved the OSI, but rather a reduction in the product's degree of saturation. For example, the Board cited Kodali⁴, stating that “[i]ndeed, Kodali discloses that ‘[t]ransesterifying various short saturated fatty acid esters with vegetable oil *improves oxidative stability...due to the increased saturation and the heterogeneity* of the fatty acid esters to the polyols.’” I.D., 26 (quoting EX-1015, [0005], emphasis in I.D.). Thus, Kodali expressly ties the observed improved oxidative stability to increased saturation in the product, a step which does not take place in the process claimed in the '245 Patent. EX-2009, ¶145.

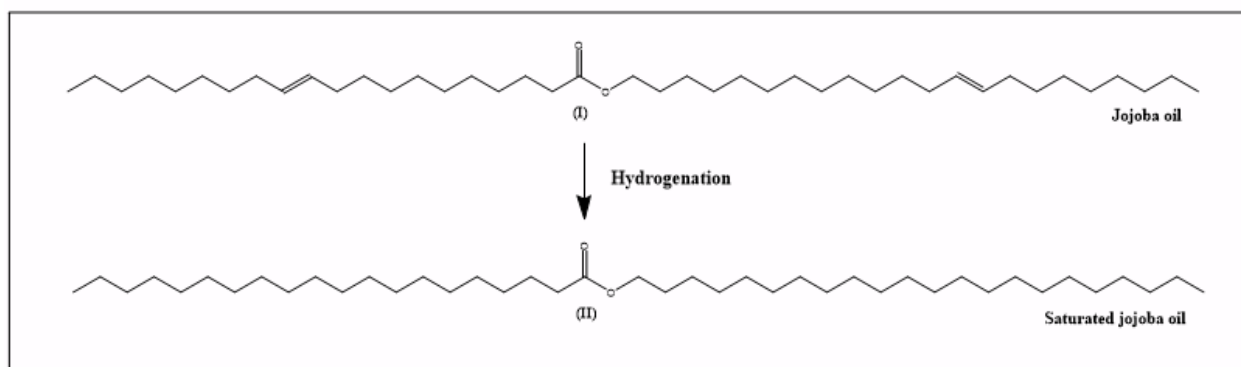
Likewise, the Board's statement that “[*m*]odifying the saturation and heterogeneity within the resulting mixture of wax esters appears to be a key characteristic of the transesterification reaction itself,” citing Figure 1 in Cummings (EX-1004), similarly overlooks that it is an ester-ester exchange being claimed. I.D., 26 (emphasis added). The Board's confusion is understandable—

⁴ Notably, during prosecution the applicant overcame a rejection to Kodali, further demonstrating that the claims of the '245 Patent are patentable despite Kodali's allegations about improved oxidative stability. See EX-1002, Pt. 2, 376-376 (rejection), 422-423 (withdrawing rejection).

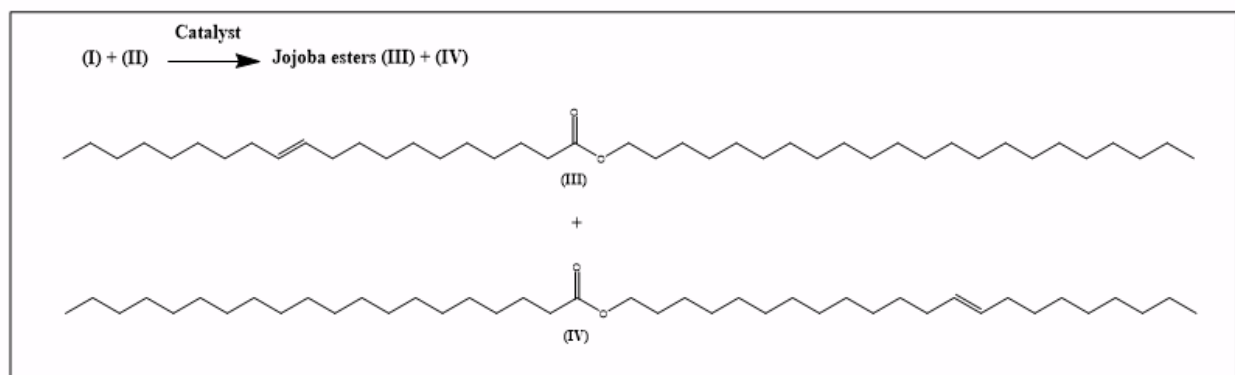
Figure 1 of Cummings shows **both** hydrogenation, which saturates the two double bonds, **and** ester-ester exchange, which does not affect overall saturation:

Figure 1 - Jojoba ester production

HYDROGENATION REACTION



ESTER-ESTER EXCHANGE REACTION



Adapted from EX-1004, 2; *see also* EX-2009, ¶146. But hydrogenation and ester-ester exchange are **two distinct** steps. In the '245 Patent, hydrogenation has already occurred, as the hydrogenated jojoba wax esters are part of the claimed feedstock that undergoes the ester-ester exchange. Ester-ester exchange does not affect the degree of saturation. EX-2009, ¶146. The Board is correct that oxidative stability “depends in significant part on the degree of saturation,” (I.D.,

27); but when the degree of saturation (i.e. number of double bonds) is not changed by the reaction, as is the case in the claimed method, a POSITA would not have expected the oxidative stability to change either. EX-2009, ¶146.

The invention of the '245 Patent is non-obvious in part because it was so surprising that a meaningful increase in OSI could be achieved with the same number of double bonds present in both the feedstock and the transesterified product. *Id.*, ¶147.

E. Vantage's Use of Iodine Values to Back-Calculate Percent of Hydrogenated Wax Esters in the Feedstock Was Unreliable

Claim 1 requires a feedstock “wherein the amount of hydrogenated jojoba wax esters is 20% to 50% by weight of the feedstock.” EX-1001, cl. 1. As the Board recognized, Vantage's attempts to estimate the weight percentage of the reactants in the feedstock based on an alleged correlation between an iodine value (“IV”) given in the prior art and the number of double bonds present in the product fail for multiple reasons. I.D., 18; *see also* EX-2009, ¶¶148-159.

Vantage did not establish the actual compositions of the jojoba ester “products.” The IVs reported in the art are for *commercial* products following transesterification. *See* EX-1004, Fig. 3; EX-1006, 3. The back-calculation of the weight percentages of the original feedstock components (i.e., the reactants) from these values therefore relies on multiple, likely mistaken, assumptions. *See* EX-

2009, ¶¶149-159. The processing methods used on the jojoba esters (30) and (60) are unknown, as are their corresponding yields. Therefore, it is not possible to assess whether the commercial products are in fact reflective of the reaction products made by transesterification. Further, the art does not identify whether the commercial products contained only the desired ester compositions (i.e., those shown in Cummings, Fig. 2), whether they included side-products or unreacted feedstock, or whether (as would be expected) they were subjected to post-reaction refining processes. All of these factors impact IV, and Vantage did not account for any of them. *See* EX-2009, ¶¶154-155. Without knowledge of the full composition of the commercial jojoba ester products it relies upon, Vantage cannot accurately back-calculate the weight percentages of the reactants in the feedstock using IV. *Id.*

Moreover, Vantage's back-calculation neglects to consider the impact of other factors on the IV of a product, including the difference between calculating the IV of a pure compound and a mixture. EX-2009, ¶¶156-158.

Apart from the iodine value calculations, Vantage also relies on Sessa to teach the limitation of "wherein the amount of hydrogenated jojoba wax esters is 20% to 50% by weight of the feedstock." Pet., 31-35. Sessa teaches testing the properties of a range of FloraEsters final products (i.e., calibration sets) made with a chemical catalyst and subject to further processing. EX-1009, 1-2. But Sessa's

calibration sets do not meet this limitation, because Sessa does not disclose a *feedstock*. Sessa’s “Materials and Methods” section is a single sentence that states: “[n]atural cocoa butter and the calibration sets consisting of native jojoba wax esters that *were transesterified* with proportionate blends of completely hydrogenated wax esters *to give* a series of 50, 100, 150, 200, 300, 400 and 500 g kg-1 saturated ester were provided by [Floratech].” EX-1009, 2. In other words, Sessa uses products that have already been transesterified and further processed. EX-2009, ¶¶159. The feedstock Floratech used to perform the transesterification and processing to make those transesterified products is not disclosed. Therefore, Sessa, is just as silent to the composition of the feedstock as is Cummings. Consequently, Vantage has no evidence to support its contentions regarding limitation [1a] requiring 20-50% by weight hydrogenated jojoba wax esters in the feedstock. *Id.*

F. Dependent Claims Are Patentable Over Ground 1 Prior Art

Vantage’s Petition gives short-shrift to dependent claims 2, 3, and 5. Claim 2 requires that the feedstock “consists essentially of the jojoba wax esters and the hydrogenated jojoba wax esters,” meaning that it does not contain other materials in the feedstock that could alter OSI. EX-1001, cl. 2. Vantage argues that the same combination that renders claim 1 unpatentable “teaches such a feedstock—*e.g.*, no additional OSI-affecting materials,” and therefore meets claim 2. Pet., 41.

Vantage makes no other effort to show how the feedstocks in Cummings or Sessa meet this limitation. Vantage instead relies on the scantness of their disclosures. But neither Cummings nor Sessa discloses the full composition of the feedstocks to know whether they in fact contain any additional OSI-affecting materials. Sessa's "Materials and Methods" section is a single sentence that explains Sessa used an already-transesterified product, with no detail of how that was done or what feedstock was used. EX-1009, 2; EX-2009, ¶¶160-161. Likewise, other than identifying the individual fatty acids found in the jojoba esters, Cummings does not disclose any other information about the composition of those commercial products, let alone their feedstocks. *See* EX-1004, 2. This lack of information is not sufficient for Vantage to meet its burden of proof.

Claims 3 and 5 require that the feedstock does not comprise "any free fatty acids" or "any methyl esters," respectively. EX-1001, cls. 3, 5. Because neither Cummings nor Sessa discloses any information about the composition of the feedstocks used to produce their transesterified products, Vantage cannot meet its burden to show that this limitation is disclosed. EX-2009, ¶¶161.

VII. CLAIMS 1, 2, 3 AND 5 ARE PATENTABLE OVER GROUND 2

A. A POSITA Would Not Have Been Motivated to Use Xu's Lipases with *Trans* Isomers 2

Relying on *Trans* Isomers 2 instead of Cummings does not rectify Ground 1's lack of disclosure of lipases for esterification, as *Trans* Isomers 2 is also silent

as to lipases. For the same reasons discussed for Ground 1, a POSITA reading Xu would not have been motivated to use a lipase with *Trans* Isomers 2 or have expected esterification with lipases to result in increased OSI compared to a feedstock. EX-2009, ¶¶162-163.

B. Vantage Fails to Identify OSI Values in *Trans* Isomers 2

Trans Isomers 2 has similar disclosures to Cummings, reporting the OSI values for Jojoba Esters 15, 20, 30, 60, and 70 in Table 4. *See* EX-1006, 3. Again, as with Cummings, these values are for the OSI of Floratech’s Floraesters products that have undergone post processing including addition of tocopherols, as discussed for Ground 1. EX-2009, ¶¶164-166.

Vantage relies on *Trans* Isomers 2’s description of a partially hydrogenated jojoba oil as the alleged feedstock, but as the Board correctly noted, there is “no teaching in *Trans* Isomers 2 that the ‘Jojoba oil Partial Hydrogenate[s]’ of Table 4 form any part of a feedstock,” rather “to the contrary, these hydrogenates appear to be comparative *products* made by a different method—not interesterification.” I.D., 33. The Board also correctly noted that the fact that these “Partial Hydrogenate[s]” include a material *trans* isomer component, when the same document states that the “reported Jojoba Esters contain *no* trans isomers only underscores that Table 4’s hydrogenates are neither the feedstock nor the product of interesterification.” *Id.* (emphasis in original); *see also* EX-2009, ¶165.

Because *Trans* Isomers 2 neither discloses the OSI of a feedstock nor the product, it cannot disclose a comparison of the same, let alone whether OSI could have increased or decreased. EX-2009, ¶¶164-166.

C. Iodine Values Cannot Be Used to Calculate Percent Hydrogenated Feedstock

Relying on *Trans* Isomers 2 instead of Cummings does not rectify Ground 2's unreliable iodine value calculations, for the same reasons as discussed with Ground 1. EX-2009, ¶167.

D. Dependent Claims Are Patentable

Relying on *Trans* Isomers 2 instead of Cummings does not rectify Ground 2's deficiencies as to claims 2, 3, and 5, because *Trans* Isomers 2 identifies the same transesterified products as Cummings, with no additional details about the feedstock used to produce those products. Therefore, claims 2, 3, and 5 are patentable for the same reasons as discussed with Ground 1. EX-2009, ¶168.

VIII. CLAIMS 1, 2, 3 AND 5 ARE PATENTABLE OVER GROUND 3

A. A POSITA Would Not Have Been Motivated to Use *Trans* Isomers 1's Enzymes with *Trans* Isomers 2

Relying on *Trans* Isomers 1 instead of Xu does not rectify Ground 1 or 2's lack of disclosure of lipases for esterification, as *Trans* Isomers 1 contains an even more sparse disclosure of lipases than does Xu. EX-2009, ¶¶169-170.

Vantage relies on a single sentence from *Trans* Isomers 1 under the heading “Alternatives to Trans Isomers in Cosmetic Products” that does not mention jojoba wax esters, and merely states “Rozenaal [8] discussed use of this interesterification process to modify the melting characteristics of triglycerides using various catalysts including enzymes.” EX-1005, 3. This sentence discloses nothing more than the possibility of selecting an enzyme catalyst amongst other “various catalysts” to interesterify triglycerides as a means of changing its melting characteristics. *Id.* Indeed, Rozenaal itself confirms this. *See* EX-2030, 3 (“Unlike hydrogenation, [interesterification] leaves the fatty acid composition unchanged and only alters the distribution of the fatty acids over the *triacylglycerols*.”); *id.* (“Interesterification will lead to the so-called random distribution of fatty acids over the *triacylglycerols* if the process is carried out in a single phase with the usual types of catalysts.”), (“Enzymes, such as lipases, can accomplish the exchange of fatty acids at the external positions of the triacylglycerol molecule but leave the fatty acid composition at the 2-position unchanged”); *id.*, 4 (“In Table 1 the number and amount of the various *triacylglycerols* obtainable by interesterification of mixture containing different fatty acids are shown.”) (emphasis added). Nothing in Rozenaal teaches or suggests the transesterification of jojoba wax esters or any other wax ester, let alone the use of a lipase to catalyze the transesterification of jojoba wax esters.

Therefore, for the same reasons discussed for Ground 1, a POSITA reading *Trans* Isomers 1 would not have been motivated to use a lipase with *Trans* Isomers 2 or have expected esterification with lipases to result in increased OSI compared to a feedstock. EX-2009, ¶¶170-172.

B. Vantage Fails to Identify OSI Values in *Trans* Isomers 2

Relying on *Trans* Isomers 1 instead of Xu does not rectify Ground 1 or 2's lack of disclosure of a comparison showing increased OSI of an esterified product compared to the feedstock, since *Trans* Isomers 1, like Xu, does not disclose OSI values. EX-2046, 33:6-15; EX-2009, ¶173.

C. Iodine Values Cannot Be Used to Calculate Percent Hydrogenated Feedstock

Relying on *Trans* Isomers 1 instead of Xu does not rectify Ground 2's unreliable iodine value calculations, for the same reasons as discussed with Ground 1. EX-2009, ¶174.

D. Dependent Claims Are Patentable

Relying on *Trans* Isomers 1 instead of Xu does not rectify Ground 2's deficiencies as to claims 2, 3, and 5, for the same reasons as discussed with Grounds 1 and 2. EX-2009, ¶175.

IX. CLAIMS 1, 2, 3 AND 5 ARE PATENTABLE OVER GROUND 4

A. A POSITA Would Not Have Been Motivated to Use Xu's Lipases with Brown

Relying on Brown in addition to Cummings does not rectify Ground 1's lack of disclosure of lipases for esterification, as Brown is also silent as to lipases. *See* EX-2046, 50:17-52:3. For the same reasons discussed for Ground 1, a POSITA reading Xu would not have been motivated to use a lipase with either Brown or Cummings, or have expected esterification with lipases to result in increased OSI compared to a feedstock. EX-2009, ¶176.

B. Vantage Fails to Identify OSI Values in Brown

Relying on Brown in addition to Cummings does not rectify Ground 1's lack of disclosure of the OSI of a feedstock or a comparison showing increased OSI of an esterified product compared to the feedstock, since Brown does not disclose OSI values. EX-2046, 52:4-14; EX-2009, ¶177. Additionally, Brown primarily discloses an alcoholysis reaction, not an ester-ester exchange as required by the claims, rendering it even further inapposite. *See* EX-1007, 3:59-4:3.

C. Iodine Values Cannot Be Used to Calculate Percent Hydrogenated Feedstock

Relying on Brown in addition to Cummings does not rectify Ground 1's unreliable iodine value calculations, for the same reasons as discussed with Ground 1. EX-2009, ¶178.

D. Dependent Claims Are Patentable

Relying on Brown in addition to Cummings does not rectify Ground 1's deficiencies as to claims 2, 3, and 5. EX-2009, ¶179. Regarding claim 2, Brown is silent as to other ingredients that may affect OSI; Brown does not teach that such ingredients should not be excluded from the feedstock. Regarding claim 3, free fatty alcohols are alcohols that contain long carbon chains (between 4 and 26 carbons) and are not attached to an ester. Brown expressly discloses using such free fatty alcohols in the "starting materials" or feedstock. *See* EX-1007, 4:7-18 (disclosing starting material of R⁴-OH, then defining R⁴ as "an alkyl group or other aliphatic group, preferably of 1 to 12 carbon atoms[.]"); *id.*, 4:63-64 (same). Regarding claim 5, Brown is also silent as to methyl esters; Brown does not teach that methyl esters should be excluded from the feedstock. Therefore, claims 2, 3, and 5 are patentable.

X. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

The novelty of using the '245 Patent's lipase-catalyzed ester-ester exchange process to interesterify jojoba oil is further demonstrated by significant evidence of secondary considerations of non-obviousness, including unexpected results, failure of others, copying, and the age of Vantage's prior art at the time of the invention. EX-2009, ¶¶180-185. Notably, the unexpected results shown in the '245 Patent, prosecution history, and in the literature preclude Vantage from relying on

inherency to argue that OSI would have been expected to increase after transesterification.

A. Prior Art and Prosecution History Show Transesterification Was Unpredictable and Therefore the Results of Using the Claimed Invention Were Unexpected

Vantage's Petition and the Board's Institution Decision rely on the assumption that a transesterification reaction inherently results in a product with increased oxidative stability or OSI. Pet., 38-40; I.D., 26. But the prior art, the specification of the '245 Patent, and the testing disclosed during prosecution demonstrate that this assumption does not hold true, for either chemical or enzymatic transesterification. EX-2009, ¶181.

Regarding chemical transesterification, as noted previously, the Board relies heavily on Kodali's allegation that "[t]ransesterifying various short saturated fatty acid esters with vegetable oil *improves oxidative stability*[" I.D., 26 (quoting EX-1015, [0005], emphasis in I.D.). In addition to being inapposite for the reasons discussed above, this generalized statement is also undermined by Kodali's own experimental results. EX-2009, ¶182. In Example 5, Kodali provided data for its transesterification method, and observed from Table 1 that "[t]he oxidative stabilities of the transesterified products without added antioxidants *were lower* than the starting oil[" EX-1015, [0081] (emphasis added). To achieve an

oxidative stability that was greater than the oxidative stability of the feedstock, antioxidants had to be added. *Id.*

The statements in Kodali are consistent with the '245 Patent's description of prior art chemically catalyzed processes that resulted in products with lower OSI than the unmodified oil and the '245 Patent's testing using a chemical catalyst. *See* EX-1001, 7:24-42, 9:26-47; EX-2009, ¶183. In contrast, as discussed above in Section III(A), in the claimed invention using a lipase catalyst, the oxidative stability surprisingly improved without the addition of *any* antioxidants. *Id.*, 9:26-47. Further, the improvement in oxidative stability could not be explained simply by the preservation of the tocopherols naturally present in the jojoba oil. *Id.*, 9:56-62. Therefore, the data in Kodali independently confirms that a POSITA at the time of the invention would have understood that obtaining a product with higher OSI was not a matter of simply transesterifying a feedstock. EX-2009, ¶183.

Regarding enzymatic transesterification, in addition to the surprising results disclosed in the '245 Patent and discussed in Section III(A), the two declarations submitted during prosecution from inventor Jeff Addy demonstrated that different, and sometimes even opposite results could be obtained using the same transesterification reactions—here, prior art alcoholysis methods. EX-2009, ¶184. As discussed in Section III(B), Addy first replicated a lipase-catalyzed alcoholysis reaction from Steinke using two oils that had similar starting oxidative parameters:

a triglyceride oil (crambe oil) and jojoba oil. Far from obtaining the same result, Addy found that enzymatic alcoholysis had a negligible effect on crambe oil, with an increase of only about one hour, but effected over a three-fold increase in oxidative stability of jojoba oil. EX-1002, Pt. 2, 467-468. Addy then replicated a different alcoholysis method from Gunawan, comparing the effects of transesterifying another triglyceride oil (sunflower oil) as compared to jojoba wax esters. This time, the alcoholysis reaction had the opposite effect—the oxidative stability of the transesterified jojoba oil went down compared to the feedstock, while the oxidative stability of the transesterified sunflower oil increased slightly. *Id.*, Pt. 4, 841.

Kodali and Addy's testing support the '245 Patent's disclosure of the unpredictable nature of transesterification reactions and the unexpected results achievable with the claimed invention. EX-2009, ¶185. A POSITA at the time of the invention would not have been able to predict whether oxidative stability would increase, decrease, or stay the same based on either a given transesterification reaction or feedstock composition. *Id.* It was therefore surprising that the claimed invention of a lipase-catalyzed ester-ester exchange could in fact consistently increase the OSI of the transesterified jojoba wax ester product in comparison to the feedstock. *Id.*

B. Unpredictability Precludes Reliance on Inherency

It is undisputed that no single reference discloses a lipase-catalyzed interesterified jojoba wax ester, much less a lipase-catalyzed interesterified jojoba wax ester having greater OSI than the OSI of the feedstock. Therefore, to argue that this limitation is found in the prior art, Vantage must rely on conclusory statements or an argument of inherency, specifically an assumption that a transesterification reaction inherently results in a product with increased oxidative stability or OSI compared to the feedstock. The Board clearly relied on this inherency argument in its Institution Decision to find that Vantage's evidence "support[s] a conclusion that it was known that, through transesterification, the OSI of the resulting product could be improved." I.D., 26. Because of the unpredictability of the art, however, this assumption fails as a matter of law.

The Federal Circuit has cautioned that "the use of inherency, a doctrine originally rooted in anticipation, must be carefully circumscribed in the context of obviousness." *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir. 2014). "[T]o rely on inherency to establish the existence of a claim limitation in the prior art in an obviousness analysis," Vantage must meet a "high standard," specifically that "the limitation at issue ***necessarily must be present***, or the natural result of the combination of elements explicitly disclosed by the prior art." *PAR Pharm.*, 773 F.3d at 1195-96 (emphasis added). Inherency "may not be

established by probabilities or possibilities” and “[t]he mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *PAR Pharm.*, 773 F.3d 1196 (quoting *In re Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981)).

Vantage has not, and cannot meet this exacting standard. As demonstrated by the specification of the ’245 Patent, the testing disclosed in the prosecution history, and the experimental results shown in prior art references such as Kodali, transesterification more likely than not results in a product that has lower or equivalent oxidative stability than its feedstock. *See* EX-1001, 7:24-42, 9:26-47; EX-1002, Pt. 4, 841; *id.*, Pt. 2, 467-468; EX-1015, [0081]. Reliance on inherency for that element in its obviousness analysis is improper. *PersonalWeb Techs., LLC v. Apple, Inc.*, 917 F.3d 1376, 1382–83 (Fed. Cir. 2019) (reversing the PTAB’s obviousness determination because it was only “possible” that the prior art contained an inherent limitation—and “mere possibility is not enough” to show an inherent limitation).

C. Vantage’s [REDACTED]

Vantage’s argument that the claimed invention is obvious is further undercut by [REDACTED]

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The Federal Circuit has found that “[o]bjective considerations such as failure by others to solve the problem and copying may often be the most probative and cogent evidence of nonobviousness.” *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1213 (Fed. Cir. 2023) (quoting *Advanced Display Sys. v. Kent State Univ.*, 212 F.3d 1272, 1285 (Fed. Cir. 2000)); *see also In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Pat. Litig.*, 676 F.3d 1063, 1081 (Fed. Cir. 2012) (“Evidence that others tried but failed to develop a claimed invention may carry significant weight in an obviousness inquiry.”). In fact, “there can be little better evidence negating an expectation of success than actual reports of failure.” *In re Cyclobenzaprine*, 676 F.3d at 1081 (quoting

Boehringer Ingelheim Vetmedica, Inc. v. Schering–Plough Corp., 320 F.3d 1339, 1354 (Fed. Cir. 2003)).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. Any argument now that a POSITA looking at prior art over a decade old would somehow have been motivated to achieve the claimed invention, or had a reasonable expectation of success in doing so, is nothing more than litigation-driven hindsight.

D. The Ten Year Delay Between Vantage’s Prior Art and the Claimed Invention Supports Non-Obviousness

Finally, all of the prior art in Vantage’s grounds was published over a *decade* before the application that issued as the ’245 Patent was filed. EX-2046, 24:3-10; 32:23-33:5; 41:24-42:10, 48:22-49:11, 52:22-53:11, 58:7-19. This fact, with which Vantage never grapples, is further evidence of non-obviousness. *See Leo Pharm. Prods. Ltd. v. Rea*, 726 F.3d 1346, 1359 (Fed. Cir. 2013) (“The length of the intervening time between the publication dates of the prior art and the claimed invention can also qualify as an objective indicator of nonobviousness.”); *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1215 (Fed. Cir. 2023) (prior art’s “age *can* be relevant to long-felt unresolved need.”)

(emphasis in original). In other words, that no one used lipases to esterify jojoba oil until the inventors of the '245 Patent did so and filed for their patent in 2014, over ten years after Vantage's prior art, further demonstrates that the claimed invention was novel and non-obvious.

XI. CONCLUSION

Despite lipases being known for decades before the claimed invention, the inventors provided the first description and data of lipases catalyzing the ester-ester exchange reaction of jojoba wax esters. As described above, given the fundamental structural difference between triglycerides and jojoba wax esters, there was neither a reasonable expectation that enzymatic catalysis would be successful with jojoba wax esters nor a reasonable expectation that a resulting transesterified product would have a higher OSI than its starting feedstock nor the other unexpected results.

Vantage's Petition simply fails to provide evidence to support a conclusion that a POSITA would have been motivated to try using a lipase to catalyze the interesterification of jojoba wax esters. None of the references disclose such a use, and Vantage's Petition fails to address the key differences between jojoba wax esters and triglycerides that would have prevented a POSITA from trying such a use. Dr. Rockstraw's conclusory statements, poisoned with hindsight and unfounded in the prior art, cannot fill the gap and fail as well. For obviousness to

be found, a POSITA must also have had a reasonable expectation of success. As clearly set out above, not only is there no proof that the combined references provide a reasonable expectation of success, but rather there is significant evidence to the contrary.

For at least the reasons discussed above, the Board should find claims 1, 2, 3, and 5 of the '245 patent patentable.

Respectfully submitted,

Date: December 6, 2023

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CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Patent Owner's Preliminary Response totals 13,976, which is less than the 14,000 allowed under 37 CFR § 42.24(b)(1).

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e)(4), the undersigned certifies that on December 6, 2023, a complete and entire copy of this Patent Owner's Response and its supporting exhibits were provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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