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
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
62/623,985	01/30/2018	Rocco V. Burgo	I0113-198US

CONFIRMATION NO. 4894

POA ACCEPTANCE LETTER

159443
Calderone Bullock LLC
Two Greentree Centre, Suite 301
9000 Lincoln Drive East
Marlton, NJ 08053

OC000000106521491

Date Mailed: 03/13/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/25/2019.

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.

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**.

/ytdemisse/

FILED ELECTRONICALLY

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Applications of:	:
Inolex Investment Corporation	:
103 Springer Building	:
411 Silverside Road	:
Wilmington, DE 19810	:

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE U.S. PATENT AND TRADEMARK OFFICE

Inolex Investment Corporation, assignee of the above application, by its undersigned representative, hereby revokes all previous powers of attorney given in the application identified in the enclosed Statement Under 37 C.F.R. §3.73(c).

Inolex Investment Corporation, by its undersigned representative, hereby appoints the registered attorneys and agents associated with Customer No. 159443, Calderone Bullock LLC, as its attorneys or agents to represent the assignee before the United States Patent and Trademark Office (U.S. PTO) in connection with any and all patent applications assigned only to the undersigned according to the U.S. PTO assignment records or assignment documents attached to this form and/or to the enclosed Statement Under 37 C.F.R. §3.73(c) and in accordance therewith, with full power of substitution and revocation, to prosecute the application identified in the enclosed Statement Under 37 C.F.R. § 3.73(c) and to transact all business in the U.S. PTO connected therewith.

Please change the correspondence address for the application identified in the enclosed Statement Under 3.73(c) to the address associated with **Customer No. 159443, namely, CALDERONE BULLOCK LLC**, Two Greentree Centre, 9000 Lincoln Drive East, Marlton New Jersey 08053. Please direct all communications and telephone calls to Lynda Calderone at (856) 446-6045 (telephone) or (856) 267-5370 (facsimile).

The undersigned states that he/she is authorized to sign the document on behalf of the assignee of the above application, and he/she certifies that, to the best of assignee's knowledge

and belief, title to the above application is in assignee by virtue of the documents provided and/or referenced in the enclosed Statement Under 37 C.F.R. §3.73(c).

Respectfully submitted,

INOLEX INVESTMENT CORPORATION

February 6, 2019
Date

By: _____
Name: David C. A. Plimpton
Title: CEO
Telephone: 215-320-1507

ELECTRONICALLY FILED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of: Inolex Investment Corporation	:	
	:	Group Art Unit:
Conf. No.: 4894	:	
Appln. No.: 62/623,985	:	Examiner:
Filing Date: January 30, 2018	:	Attorney Docket No.: I0113-198US

Title: Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols and Methods of Making Same

STATEMENT UNDER 37 C.F.R. § 3.73(c)

3.73 (c) Statement:

Assignee, Inolex Investment Corporation, is owner of the entire right, title and interest in and to the above-referenced application and its related applications by virtue of the chain of title noted below, and as set forth in the Appointment of Attorney by Assignee filed simultaneously herewith. As required under 3.73(c)(1)(i), and as described below, all documentary evidence of the chain of title set forth herein and in Appointment of Attorney was submitted for recordation pursuant to 37 C.F.R. 11. Inolex Investment Corporation is the owner by virtue of:

[X] An assignment from the inventor of the above-identified patent application dated May 31, 2018, that was recorded in the United States Patent and Trademark Office (PTO) on June 11, 2018 at Reel 046048, beginning at Frame 0974.

The undersigned (whose title appears below) is authorized to act on behalf of assignee in this application as set forth in the Revocation and Appointment of Attorney by Assignee filed herewith.

Respectfully submitted,

INOLEX INVESTMENT CORPORATION

7/25/18 By: _____

LYNDA L. CALDERONE, Managing Member and Attorney for Assignee
Registration No. 35,837
CALDERONE BULLOCK LLC
Two Greentree Centre
9000 Lincoln Drive East, Suite 301
Marlton, NJ 08053
Telephone: (856) 446-6045
Direct Dial: 856-446-6043
Facsimile: (856) 267-5370
E-Mail: lcalderone@calderonebullock.com

[X] Customer Number or Bar Code Label: **159443**

LLC/jxv

Electronic Acknowledgement Receipt

EFS ID:	35237290
Application Number:	62623985
International Application Number:	
Confirmation Number:	4894
Title of Invention:	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same
First Named Inventor/Applicant Name:	Rocco V. Burgo
Customer Number:	54380
Filer:	lynda Leigh Calderone
Filer Authorized By:	
Attorney Docket Number:	I0113-198US
Receipt Date:	25-FEB-2019
Filing Date:	30-JAN-2018
Time Stamp:	19:02:19
Application Type:	Provisional

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA.pdf	72241 776483c7baaea4b50011400999fb34ef47668894	no	2

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	198US.pdf	65073 d25aa69947e50f9884b32a1a8f159021870cc4b5	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	137314	

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

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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
62/623,985	01/30/2018		280	I0113-198US		

CONFIRMATION NO. 4894

FILING RECEIPT

OC000000097726641

54380
FLASTER/GREENBERG P.C.
1810 Chapel Avenue West
Cherry Hill, NJ 08002

Date Mailed: 03/01/2018

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. 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)

Rocco V. Burgo, Mullica Hill, NJ;

Applicant(s)

Inolex Investment Corporation, Wilmington, DE;

Power of Attorney:
Lynda Calderone--35837

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/28/2018
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/623,985**
Projected Publication Date: None, application is not eligible for pre-grant publication
Non-Publication Request: No
Early Publication Request: No
Title

Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same

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 AssetsControl, 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.

PROVISIONAL PATENT APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 C.F.R. §1.53(c).

Electronically Filed	Attorney Docket No.:	I0113-198US

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Rocco	Burgo	Mullica Hill, NJ

☐ Additional inventors are being named on _____ separately numbered sheets attached hereto

TITLE OF INVENTION (500 characters maximum)

Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same

CORRESPONDENCE ADDRESS

Customer No.: 000054380
FLASTER/GREENBERG
1810 Chapel Avenue West
Cherry Hill, NJ 08002
Telephone: 856-661-1900
Facsimile: 856-661-1919

ENCLOSED APPLICATION PARTS (*check all that apply*)

☒ Specification - *Number of Pages:* 30
☒ Drawing(s) - *Number of Sheets:* 1
☒ Application Data Sheet

☐ CD(s), *Number:*
☐ Other (specify) _____

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☐ Applicant(s) claim Micro Entity Status under 37 C.F.R. §1.29; ☐ a Certification Under ☐ 1.29(a)/ ☐ 1.29(d) is enclosed
☐ Applicant(s) claim Small Entity Status under 37 C.F.R. §1.27 as:
☐ an Independent Inventor, or ☐ a Small Business Concern, or ☐ a Non-Profit Organization.
☐ The additional sheet fee applies for this provisional which is over 100 pages: $100/$200/$400 per each additional 50 pages over 100 pages: ___ additional sets of 50 sheets are enclosed for a total charge of $___
☒ The applicants herewith pay the following fees by charging to credit account Flaster Greenberg PC VISA (Billing No. I0113.0198):
☒ Provisional Application Filing Fee in the amount of $280 under 37 CFR §116(d) (Fee Code 2005).
☐ The additional sheet fee noted above $_____.
☒ The Commissioner is hereby authorized to charge or credit Deposit Account No. 50-3541 as indicated below
☒ Any deficiencies or overpayments in the above-calculated fee.
☒ Any additional fees required under 37 CFR §1.16 or §1.17.

The invention was made by an agency of the United States Government or under a contract with an agency of the U.S. Government.
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are:

1/30/08
Date

Respectfully submitted,

Lynda L. Calderone
Reg. No. 35,837
FLASTER/GREENBERG P.C.
1810 Chapel Avenue West
Cherry Hill, NJ 08002
Phone: 856-661-1900/Facsimile: 856-661-1919
Direct Dial: 856-382-2206
E-mail: @%@flastergreenberg.com

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

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.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Rocco	V.	Burgo	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	Mullica Hill	State/Province	NJ	Country of Residence i	US

Mailing Address of Inventor:

Address 1	604 Widgeon Court		
Address 2			
City	Mullica Hill	State/Province	NJ
Postal Code	08062	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	000054380		
Email Address	USP@flastergreenberg.com	Add Email	Remove Email

Application Information:

Title of the Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same		
Attorney Docket Number	I0113-198US	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	1	Suggested Figure for Publication (if any)	1

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

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

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	000054380		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is 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 State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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. Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Inolex Investment Corporation		
Mailing Address Information For Applicant:			
Address 1	103 Springer Building		
Address 2	3411 Silverside Road		
City	Wilmington	**State/Province**	DE
Country	US	Postal Code	19810
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	I0113-198US
	Application Number	
Title of Invention	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols And Methods Of Making Same	

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Signature	/Lynda L. Calderone/			Date (YYYY-MM-DD)	2018-01-30
First Name	Lynda L.	Last Name	Calderone	Registration Number	35,837

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TITLE OF THE INVENTION

[0001] Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols and Methods of Making Same

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The invention herein relates to the field of natural antimicrobial components or alternative preservation systems for use in compositions applicable to various industries, including personal care, household and cleaning products, vitamins, medical or other related uses, and particularly in personal care compositions, and more particularly to natural 1,2-alkanediols, methods for making natural 1,2-alkanediols and compositions including natural 1,2-alkanediols.

DESCRIPTION OF RELATED ART

[0003] In most countries, including the United States, cosmetic or personal care ("personal care products") and other consumer products are manufactured and packaged in clean, but not typically sterile conditions, and many are sold in non-sterile forms. As a result, inconsequential (and usually harmless) amounts of bacteria, mold or yeast spores (collectively, "microbes") may be caught in product. In addition, once a consumer has purchased, opened and begun using the product in question, further contamination may occur. For example, in personal care compositions, small amounts of microbes from the air or a consumer's skin may further contaminate the product.

[0004] Over time, during transit, storage or use the initial microbe population that was negligible may increase to a level significant enough to result in discoloration or fouling of the product, including the appearance of visible mold, which can impact the usefulness or performance of the product. In the case of personal care compositions or other products that are applied or ingested (such as vitamins, etc.), it can have a health impact as well and in some instances can lead to adverse skin reactions upon application, including infection.

[0005] To address the issue of microbial growth, manufacturers in the personal care industry and in other industries commonly add chemical preservatives to such products and compositions. However, the type and amount of preservative that can be used is subject to

restrictions on several fronts: (1) legislative (in some countries, use of particular preservatives are prohibited); (2) technical (the type/amount of preservative must demonstrate its efficacy by meeting certain empirically assessed criteria ("challenge testing"); (3) consumer preference (consumers may perceive certain preservative chemicals as undesirable, so products including them are not commercial viable); and (4) logistical (*e.g.*, selected preservative must be effective in the relevant chemical environment (where parameters such as pH, hydrophobicity/hydrophilicity, etc. may vary) and be production cost friendly).

[0006] There is also a desire to develop alternatives to traditional preservation and to find natural or more user-friendly chemical component combinations that act as antimicrobial components but are alternatives to traditional preservatives ("alternative preservation").

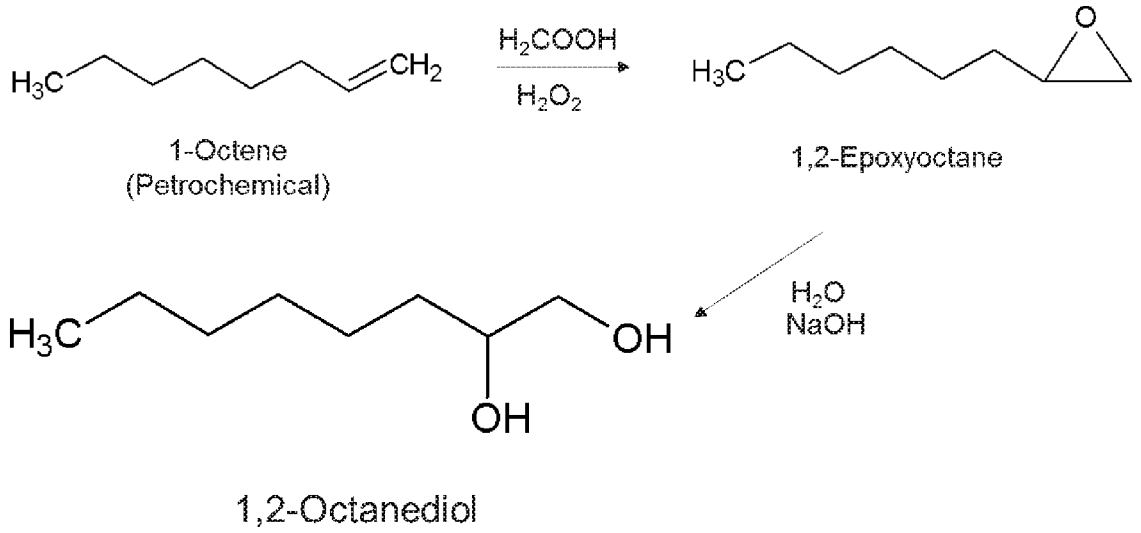
[0007] To resolve issues with traditional preservatives, the applicant herein developed a prior art preservative for personal care compositions that does not include parabens, formaldehyde donors and chlorinated compounds, so that can be used in all types of personal care formulations (*e.g.*, both "leave-on" and "rinse-off" products). Such paraben-free or other chemical-free alternative preservation products are attractive to consumers. The paraben- and chemical-free preservative demonstrates efficacy against a broad spectrum of microorganisms at various levels of pH, especially neutral pH. This preservative is described in U.S. Patent Publication No. 2017/0360035 A1. One of the components in the preservative system in that Publication is a 1,2-alkanediol.

[0008] Another attempt in the art to reduce the use of traditional preservatives is "hurdle technology." Hurdle technology is the practice of applying several types of restricting or preservative materials or processes so that microbes have a "hurdle(s)" to overcome before they can proliferate to spoilage levels (e.g., adding something to change pH to reduce proliferation and a smaller amount of preservative or other compound that together retard or create "hurdles" to microbial growth). Use of alternative preservation can be one step or "hurdle" in hurdle technology.

[0009] There is a need in the art to develop further "alternative preservation" additives or systems. also known as "hurdle technology," that include consumer-friendly, paraben- and chemical-free materials that move away from traditional preservation or antimicrobials toward "natural" sources, as that term is defined herein.

[0010] One diol employed in preservation, caprylyl glycol, is believed by the applicant to be the fastest growing alternative preservation component in the world. Other 1,2-alkanediols such as 1,2-hexanediol, 1,2-decanediol, and 1,2-dodecanediol are also growing in popularity.

[0011] An example of one reaction to prepare caprylyl glycol (1,2-octanediol) using an alkene as a key starting material is shown below. The starting material used is a petrochemically-derived 1-octene:



In the above reaction, the 1-octene is reacted in in the presence of formic acid and peroxide to form an intermediate epoxyalkane (1,2-epoxyoctane) which then undergoes a ring opening reaction in water with sodium hydroxide to form the 1,2-octanediol. This provides an excellent alternative preservation additive and is paraben-free, but it is not naturally-derived.

[0012] While, as noted above there is a need for more consumer-friendly, alternative preservation systems (used alone or as part of hurdle technologies), including those that are paraben-free, a further need in the art is a desire to use a 100% natural antimicrobial that can be used as or in alternative preservation systems. A “natural” antimicrobial is one that is plant- or vegetable-derived (*e.g.*, it comes from vegetable sources, or biomass, and is not petrochemically-derived). Such products are referred to herein as "natural" products, and are known in the art as non-petrochemically-derived or “bio” products.

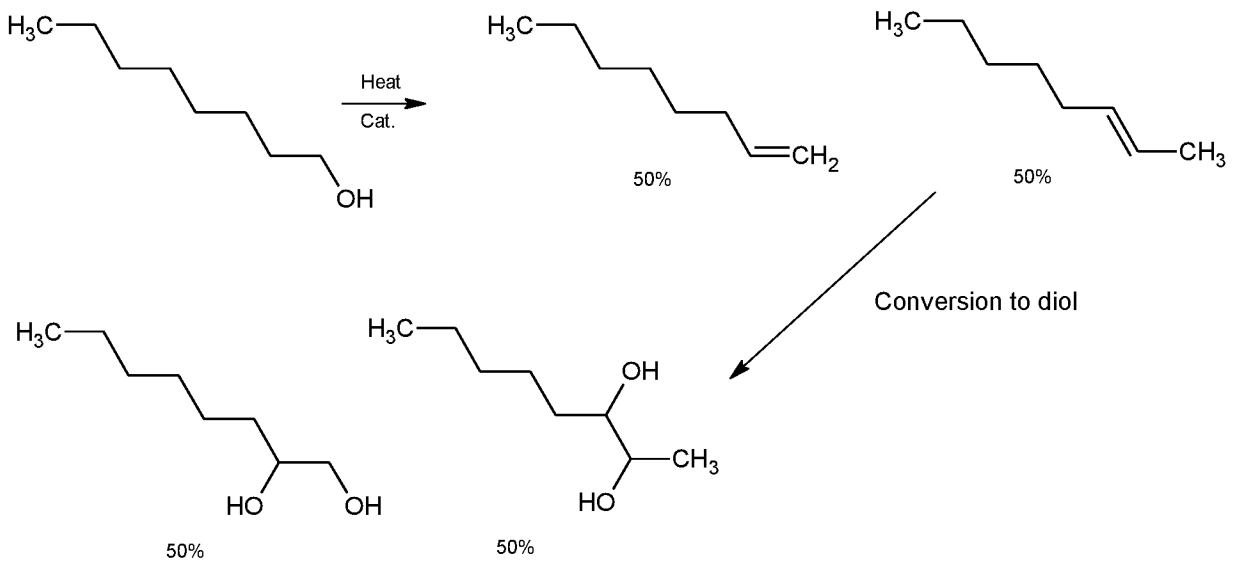
[0013] These bio-based or “natural” products may be tested to determine that they come from a true natural source. As some products known or advertised as from natural sources can also be synthesized in a lab, they may not be truly natural products. A natural product is a compound produced naturally by a living organism and that uses a compound from a primary

or secondary metabolic pathway. To distinguish lab synthesized natural products from true natural products, one must test for the authenticity using a test known as compound specific stable isotope analysis (CSIA) and/or gas chromatography. Such testing is available through organizations such as the Center for Applied Isotope Studies at the University of Georgia. True natural products (bio-compounds) are formed using biomass (e.g., material stored from carbon cycle processes in plants and roots, etc. or released through animal respiration or through decomposition). When carbon decomposes and is broken down over millions of years under pressure, it creates fossil fuels (petrochemically derived carbon). Bio-compounds are derived from the carbon of plant sources/biomass, that existed recently, and not from fossil fuels.

[0014] Radiocarbon is a natural isotope of carbon, such known as ^{14}C. ^{14}C is an unstable isotope that emits radiation energy in the form of beta particles attempting to achieve stability. It ultimately decays to the more stable ^{14}N over time (characterized as its half-life) which for radiocarbon is a half-life of 5730 years. Radiocarbon is incorporated into living plant and animal sources (and resultant biomass). Because fossil fuels are derived from plant and animals living millions of years ago, most, if not all, of their radiocarbon is lost to decay. Sources of carbon as derived from newer sources are still radiocarbon active and thus their measure can be used to identify the authenticity of a true "natural" or "bio-compound." The CSIA testing and/or gas chromatography as noted above may be used to evaluate the authenticity of "natural" or "bio-compounds." The ASTM International standard for a test to determine the authenticity of a "bio-based compound" may be found as ASTM D6866-16, which distinguishes newer carbon from biomass from carbon from fossil-fuel sources. The amount of ^{14}C in biomass is known, so a percentage of carbon from a renewable source can be calculated easily from the total organic carbon in the sample as a fraction which provides the data necessary to determine if a compound is truly "natural" or a "bio-compound."

[0015] Dehydration of terminal alcohols using traditional methods to form alkene starting materials chemically yields a mixture of 1- alkenes, 2- alkenes, and 3- alkenes due to intermediate carbonium ion rearrangement. This mixture ultimately provides a mixture of diols when converted, providing a low yield of the desired terminal 1-diol material.

[0016] In one known path of forming caprylyl glycol (1,2-octanediol) starting with 1-octene from petrochemically-derived sources, the following reaction typically occurs:



As can be seen from the above-reaction scheme, the use of heat and a traditional catalyst, such as an acid catalyst converts 1-octanol to an olefin, *i.e.*, octene, however, exposure to the acid catalyst and thermodynamics (or other materials present such as impurities and the like) can cause the desired end product of a primary 1-octene formed to be mixed with an isomer wherein the bond is rearranged to form the more stable 2-octene form and, while not shown, also dioctyl ether. Thus, when using the octene mixture for conversion to form 1,2-octanediol, the reaction yields a conversion which also has a respectively low formation of the desired terminal 1,2-octanediol structure at only about 50% making the ability to form the desired preservative materials costly and more difficult, as the process requires further purification or separation, and the two resulting isomer products are not particularly easy to fully separate.

[0017] Certain "natural" 1,2-alkanediols have been made. One such material is natural bio-1-butanol. Straight chain linear primary alcohols can be obtained from hydrogenation of fatty acids derived from vegetable oils, or from fermentation of biomass.

[0018] One path to making a "natural" alkanediol is by fermentation of biomass to form a straight chain, linear alkanediol. For example, U.S. Patent Application Publication No. 2005/0069997 A1 teaches formation of 1,3 propanediol from fermentation broth; however, 1,3-propanediol is not a 1,2-alkanediol..

[0019] Another example of a natural bio-alcohol that is described in the art is bio-1-butanol, a known substance that has been in commercial production since discovered by Pasteur in 1862. Bacteria ferment sugars in this instance to form a mixture of acetone, 1-butanol and ethanol (known as ABE). Since discovery of ABE, advances in fermentation provide an optimized

production of bio-1-butanol, along with other reaction products, ethanol and acetone. While the production is improved, it is difficult to purify the bio-1-butanol (and other bio-1-alcohols that have been made to date from fermentation processes) to isolate the bio-1-butanol product from water and other impurities from the fermentation process.

[0020] Bio-1-butanol is known as a source to make biofuels and provides a pathway for converting straight chain linear primary alcohols to 1-alkenes at very high yield to improve biofuel production. In this method, bio-1-alcohols are dehydrated to bio-1-alkenes with high selectivity. The resulting bio-1-alkenes are useful in preparing flashpoint diesel and jet biofuels useful for civilian and military applications. The bio-1-butanol is dehydrated by using a bio-1-butanol dehydration catalyst that includes an inorganic support, such as γ-alumina or zinc aluminate ($ZnAl_2O_4$), and a basic aqueous solution. The support may be treated with an organosilane diluted in at least one hydrocarbon solvent and inert gas. The process converts a bio-1-butanol from a fermentation process at a ratio of about 0.1 to about 90 wt% water and produces a corresponding 1-alkene at a 92-99% regioselectivity, with only a single pass over the catalyst producing a reaction conversion of 95%.

[0021] Based on the foregoing, while progress has been made, there is a need in the art for continued improvement to consumer products such as personal care products, household products, industrual products and pharmaceutical products to provide additives, especially for antimicrobial use or for boosting the effects of known preservatives or alternative preservation systems, so as to keep products safe from contamination and fresh in storage and in use, while avoiding chemical preservatives and finding and relying on components for consumer product compositions from natural bio-sources. There is more particularly a need for a natural source to create a natural, bio-caprylyl glycol (i.e., a natural or bio-1,2-octanediol).

BRIEF SUMMARY OF THE INVENTION

[0022] The invention provides 100% “natural” or “bio-compound” that is an authentic “natural" material, and preferably includes bio-1,2-alkanediols of carbon lengths from about 5 to about 20, and preferably from 5 to about 14, that can be sold alone, in combinations of different types of bio-1,2-alkanediols, or in blends with other natural or traditional antimicrobials.

[0023] The invention includes a process for the synthesis of bio-1,2-alkanediols, comprising: providing a bio-alkene having a carbon chain of about 5 to about 20 carbon atoms

and a terminal bio-1-alkene regioselectivity of at least about 80%; converting the bio-alkene to a bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms.

[0024] In the process, the bio-alkene and the bio-1,2-alkanediol preferably each have a carbon chain of about 6 to about 14 carbon atoms, more preferably each have a carbon chain length of about 6 to 10 carbon atoms, and most preferably the bio-alkene is bio-octene and the bio-1,2-alkane diol is bio-1,2-octanediol.

[0025] The bio-alkene may result from a process wherein the catalyst may be selected from an alumina-based catalyst treated with a base, $ZnAl_2O_4$; or an γ-alumina catalyst modified by reaction with a base. The bio-alkene preferably has a terminal bio-1-alkene regioselectivity of about 92% to about 99%, and the process preferably yields at least about 92% to about 99% of the bio-1,2-alkanediol.

[0026] The bio-1-alkene noted above may be converted to the bio-1,2-alkanediol by reacting epoxyalkane having an epoxy ring, and contacting the 1,2-epoxyalkane with water and sodium hydroxide to form the bio-1,2-alkanediol. The process preferably yields at least about 80% to about 99% of the bio-1,2-alkanediol, and more preferably at least about 92% to about 99% of the bio-1,2-alkanediol. The bio-alkene may be initially formed by dehydrating a bio-1-alcohol using heat and an acid catalyst.

[0027] The invention also includes a composition, comprising at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art.

[0028] The composition may be a personal care composition, such as is a hair care composition, an oral care composition, a skin care composition or a cosmetic composition. The composition may also be a household product, such as a fabric care product or a cleaning product, or an industrial composition. The composition may also be a pharmaceutical composition, a vitamin composition, or a health care composition. The composition may also further comprise at least one other bio-compound different from the at least one bio-1,2-alkanediol.

[0029] The composition may comprise a second bio-1,2-alkanediol, different than the first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a second bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. The composition may also further comprise at least one other bio-compound different from the first and the second bio-1,2-alkanediols. The composition may further comprise an antimicrobial compound different from the first and the second bio-1,2-alkanediol and different from the other bio-compound. The composition may comprises at least one antimicrobial compound different from the at least one bio-1,2-alkanediol and different from the other bio-compound. The first bio-1-alkene preferably has a regioselectivity of about 92% to about 99%. The first bio-alkene is preferably a bio-octene and the at least one first bio-1,2-alkane diol is preferably a bio-1,2-octanediol.

[0030] Also included herein is a method for providing an antimicrobial effect to a composition, including incorporating an antimicrobial system to the composition, wherein the antimicrobial system comprises at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of at least one first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art.

[0031] The antimicrobial system in the method may further comprise a second bio-1,2-alkanediol different than the first bio-1,2-alkanediol, wherein the first bio-1,2-alkanediol has a carbon chain length of about 5 to about 20 carbon atoms and is formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art.The composition in the method may also

further comprise at least one other bio-compound different from the first and the second bio-1,2-alkanediols.

[0032] The antimicrobial system in the method may also further comprise at least one other preservative compound different from the first and the second bio-1,2-alkanediol and different from the other bio-compound. The composition in the method may further comprise at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

The antimicrobial system in the method may also comprise at least one other antimicrobial compound and/or preservative compound different from the at least one first bio-1,2-alkanediol and different from the other bio-compound. Preferably, the antimicrobial system demonstrates antimicrobial efficacy. The first bio-1-alkene in the antimicrobial system in the method preferably has a regioselectivity of about 92% to about 99%. The first bio-alkene is preferably bio-octene and the at least one first 1,2-alkane diol is preferably a bio-1,2-octanediol.

[0033] The invention also includes a method for boosting the antimicrobial efficiency of an antimicrobial and/or a preservative in a composition, comprising incorporating an antimicrobial system into the composition, wherein the second antimicrobial system comprises at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art. The antimicrobial system in the method may further comprise a second bio-1,2-alkanediol different than the first bio-1,2-alkanediol, wherein the second bio-1,2-alkanediol has a carbon chain length of about 5 to about 20 carbon atoms and is formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. The composition in the method may further comprise at least one other bio-compound different from the antimicrobial and/or preservative and different from the first and the second bio-1,2-alkanediols.

[0034] In the method, the composition may further comprise at least one other bio-compound different from the at least one first bio-1,2-alkanediol. The first bio-1-alkene preferably has a regioselectivity of about 92% to about 99%. The antimicrobial system

preferably demonstrates antimicrobial efficacy. The first bio-alkene in the antimicrobial system in the method is preferably bio-octene and the at least one first bio-1,2-alkane diol is preferably bio-1,2-octanediol.

[0035] The invention also includes an antimicrobial product, comprising at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art.

[0036] The product may further comprise a second bio-1,2-alkanediol, different than the at least one first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms and formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

[0037] The product may further comprise at least one other bio-compound different from the at least one first and the second bio-1,2-alkanediols.

[0038] The product may further comprise a second antimicrobial and/or a preservative different from the antimicrobial product. The product may also further comprise at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

[0039] The product may comprise a second antimicrobial and/or a preservative different from the antimicrobial product. In the antimicrobial product, preferably the first bio-1-alkene has a regioselectivity of about 92% to about 99% and/or preferably the antimicrobial product demonstrates antimicrobial efficacy. The first bio-alkene is preferably bio-octene and the at least one first 1,2-alkane diol is preferably bio-1,2-octanediol.

[0040] Also included is a product for boosting the efficacy of an antimicrobial and/or a preservative in a composition, the product comprises at least one first bio-1,2-alkanediol having

a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art. The product may further comprise a second bio-1,2-alkanediol, different than the at least one first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms and formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

[0041] The product preferably further comprises at least one other bio-compound different from the at least one first and the second bio-1,2-alkanediols. The product may also further comprise at least one other bio-compound different from the at least one first bio-1,2-alkanediol. Preferably, the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

[0042] The first bio-alkene is preferably bio-octene and the at least one first bio-1,2-alkane diol is preferably bio-1,2-octanediol. The product preferably also demonstrates antimicrobial efficacy.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0043] The foregoing summary, as well as the following detailed description of preferred embodiments of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings embodiments which are presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown. In the drawings:

[0044] Fig. 1 is a graphical representation of a chromatogram for the material formed in Example 1.

DETAILED DESCRIPTION OF THE INVENTION

[0045] The invention includes a process for the synthesis of bio-1,2-alkanediols. As used herein, "bio" when used with “alkanediol,” or any specific alkanediol compounds noted within this class of compounds is intended to mean that the compound, and preferably all of the

carbons in the compound within this class of compounds, as described further below are "natural" compounds that are also authentic natural compounds derived from plant sources (plants, animals or biomass) and that are non-petrochemically derived). It also means that such materials are formed from bio-1,2-alkenes. When used in the terms, "bio-alcohol," or "bio-alkene," and similar compounds herein, "bio" is intended also to have the same connotation as noted above for "bio-1,2-alkanediol." Such materials should preferably satisfy the requirements of an authentic carbon material (non-petrochemically derived) through testing such as compound specific stable isotope analysis (CSIA) and/or gas chromatography and also meet testing as set forth in the current ASTM D6866-16 standard test procedures. The invention further includes the bio-1,2-alkanediols resulting from the synthesis process.

[0046] Also disclosed herein are method of using bio-1,2-alkanediols for use as antimicrobials in a composition such as in or with an alternative preservation system and/or as hurdle technology. Also disclosed are various compositions comprising bio-1,2-alkanediols, including when used as an antimicrobial Also described are methods of boosting the antimicrobial efficacy of a composition already including a preservative or alternative preservation system, and the resulting boosted antimicrobial efficacy composition. Each of such methods includes incorporating into the composition a bio-1,2-alkanediol, combination(s) of at least two different bio-1,2-alkanediols, or combination(s) of at least one bio-1,2-alkanediol with at least one other bio-compound different from the at least one bio-1,2-alkanediol, wherein the bio-1,2-alkanediol(s) either act as a antimicrobial or boost the efficacy of another antimicrobial, preservative or other alternative preservation system already present in a composition. The bio-1,2-alkanediols may themselves be an antimicrobial product and/or a antimicrobial efficacy boosting product whether used alone, in combinations of one or more different bio-1,2-alkanediols, or in combination(s) of one or more different bio-1,2-alkanediols with at least one other bio-compound different from the bio-1,2-alkanediols and/or an optional, different antimicrobial, preservative or alternative preservation system. The bio-1,2-alkanediols when used in compositions herein exhibit antimicrobial efficacy.

[0047] In one embodiment herein, a process is described herein for synthesis of bio-1,2-alkanediols. As noted above, materials referred to herein as "natural" are intended to include materials that are non-petrochemically derived, whether synthesized from non-petrochemically derived, natural materials or formed from a natural, and preferably an authentic natural or bio-based source.

[0048] The method includes providing a bio-alkene having a carbon chain of about 5 to about 20 carbon atoms, preferably for antimicrobial end uses, about 6 to about 14 carbon atoms, and more preferably about 6 to about 10 carbon atoms, with a bio-1-octene being preferred. The bio-alkene is preferably a terminal bio-1-alkene with a traditional olefinic structure. It also preferably has a regioselectivity when prepared of at least about 80%.

[0049] Such bio-alkenes may be bio-1-pentene, bio-1-iso-pentene, bio-1-hexene, bio-1-heptene, bio-1-octene, bio-1-nonene, bio-1-decene, bio-1-dodecene, and related bio-1-alkenes up to chain length of 20 carbons. Larger or smaller bio-alkenes may also be made, however, the preferred bio-alkenes for use herein are those with sufficient chain length to serve as effective antimicrobials without losing the desired properties. Such bio-alkenes may be straight or branched chain molecules, although straight chain molecules are preferred and may include one or more functional or substituted groups for desired end effects in the end use application, for example, sulfate groups, hydroxyl groups, carboxyl groups, carboxylic acid groups, amine groups, fluorinated groups, aryl or arene groups, and similar functional groups without intending to be limiting. Preferably any such functional or substituted groups do not interfere with conversion to an alkanediol or with the antimicrobial end application desired for the particular alkanediol.

[0050] The bio-1-alkene may be made using a catalytic process. In one embodiment, the bio-1-alkene is formed using a bio-1-alcohol that is dehydrated by heating the bio-1-alcohol and passing it through a fixed bed reactor packed with a catalyst. For example, a bio-1-alcohol derived from a plant source, including biomass that can produce a related acid (e.g., 1-octanol may be derived from coconut, palm or other plant source or biomass that can produce octanoic acid). The bio-1-alcohol is then dehydrated regioselectively by feeding the material at an elevated temperature into a fixed bed reactor or other suitable reactor providing intimate contact between the bio-1-alcohol and the catalyst. The fixed bed may be packed with or otherwise arranged to provide sufficient contact with a catalyst.

[0051] The catalyst used may be an alumina-based catalyst treated with a base, such as with sodium hydroxide, potassium hydroxide, calcium acetate and the like, wherein the alumina-based catalyst may be further organosilanized with an organosilane such as diethoxydiphenylsilane; an organosilanized base-treated alumina, wherein the organosilanized base may be, for example, diethoxydiphenylsilane, dichlorophenylsilane and similar materials; $ZnAl_2O_4$; or an γ-alumina catalyst modified by reaction with a base, and similar materials

known or to be developed that are capable of carrying out the process as noted herein in a manner similar to the catalysts noted herein. The catalysts as noted above in addition to being suitable if treated with a base, may alternatively or also be treated with a organosilane or organosilane-modified material to prolong catalyst life if desired.

[0052] The bio-1-alcohol may be fed undiluted or in water through the reactor. Optional inert or nitrogen gas may be used as a purge gas to retain consistency and avoid contaminates in the process. The bio-1-alcohol is preferably fed, such as by a pump (such as an HPLC pump) or pressurized gas source at a temperature of about 200°C to about 400°C, although temperatures may be adjusted for different bio-1-alcohols depending on the reaction time and flow rate, the catalyst selected and the desired outcome. As the product is removed from the reactor, it is preferably monitored to determine content, identification of product and the ratio of bio-1-alkene conversion as well as the regioselectivity. In a preferred embodiment, the bio-1-alkene has a regioselectivity of about 92% to about 99%.

[0053] The bio-1-alcohol may also be formed using a process in which the bio-1-alcohol in water is dehydrated by heating the bio-1-alcohol with a catalyst under a purge bas as noted above in a bulk process or other continuous reactor. Base and optional organosilane treatments may also be used as well as catalysts and reaction conditions such as those noted above.

[0054] Once the bio-1-alcohol is dehydrated to form the highly regioselective terminal, bio-1-alkene, that material is then converted to a bio-1,2-alkandiol having a carbon chain length of about 5 to about 20 carbon atoms. Various chemical reactions may be used for this conversion as are known for use in standard alkene to alkanediol conversions using petrochemically derived starting materials and/or that are used for smaller chain bio-alkanes. Preferably, the bio-1-alcohol is reacted in the presence of at least one of formic acid or acetic acid, and a peroxide such as hydrogen peroxide to form a bio-1,2-epoxyalkane having an epoxy ring, and contacting the 1,2-epoxyalkane with water and a base (such as sodium hydroxide) to form a bio-1,2-alkanediol. The process noted above preferably yields about 80% to about 99%, and more preferably about 92% to about 99% of bio-1,2-alkanediol.

[0055] A bio-1-alkanol may also be converted to bio-1-alkene for use in this process by dehydrating the bio-1-alkanol using heat and an acid catalyst.

[0056] Bio-1,2-alkanediols, having a chain length of about 5 to about 20 carbon atoms and synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%, and more

preferably 92% to about 99%. In one embodiment, a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms is preferably first converted to a bio-alkene regioslectively such the resulting bio-alkene contains a terminal bio-1-alkene content of at least about 80%. Then the bio-1-alkene is converted to the 1,2-alkanediol by any known method known in the art. Resulting bio-1,2-alkanediols, having a chain length of about 5 to about 20 carbon atoms are preferably synthesized by first deyhydrating a bio-1-alkanol having a carbon chain of about 5 to about 20 carbon atoms to a terminal bio-1-alkene having a regioselectivity of at least about 80%, and more preferably 92% to about 99% of bio-1-alkene is formed, then treating the bio-1-alkene with formic or acetic acid in the presence of hydrogen peroxide to form a bio-1-epoxide, then hydrolyzing the bio-1-epoxide to a bio-1,2-alkanediol.

[0057] The bio-1,2-alkanediols as described above, may be used in a variety of compositions, whether used alone or in combination with other different bio-1,2-alkandiols according to the present invention. Such compositions may incorporate one, two or more different bio-1,2-alkanediols according to the invention herein that may act within an antimicrobial system. Such bio-1,2-alkanediol(s), may be used alone as an antimicrobial additive or in an antimicrobial system incorporating other bio-compounds (i.e., any suitable naturally derived, and preferably authentic natural product as tested using CSIA, gas chromatography and/or the ASTM standard noted above) such as bio-organic acids, bio-diols such as 1,3-propanediol, bio-1,2-butanediol, and 1,2-pentanediol that are extracts from fermentation products of bio-based starting materials and/or other antimicrobial materials, alternative preservatives, traditional preservatives or hurdle technology components as are known in the art or to be developed.

[0058] When used in a composition, the bio-1,2-alkanediols of the invention are preferably incorporated in an amount of about 0.1 to about 10 weight percent, and preferably 0.3 to about 2 weight percent, of the total composition; which amount may be varied depending on whether they are used alone for antimicrobial effect or with other components in an antimicrobial system. In the latter instance, the bio-1,2-alkanediols are preferably present in a ratio of the bio-1,2, alkanediol(s) to any other antimicrobial component(s) of about 99:1 to about 1:99, and preferably about 75:25 to about 25:75 in the antimicrobial system (wherein the system would include the bio-1,2-alkanediol(s) herein and/or any other antimicrobial, traditional preservative, alternative preservation and/or hurdle technology component(s) in the composition).

[0059] When used in certain compositions that are themselves viewed as "antimicrobial products" for providing to other formulators in various industries, the 1,2-bio-alkanediol(s) of the invention may be prepared initially as antimicrobial products that include one or more of the 1,2-bio-alkanediol materials made in accordance with the invention as described above and that incorporate one or more of the compositions as noted above, wherein such antimicrobial products may include also other bio-compounds, known antimicrobials, preservatives, alternative preservation materials or hurdle technology materials.

[0060] Examples of known preservatives and alternative preservative materials or compounds used in alternative preservation systems that may be used with the bio-1,2-alkanediols of the invention, include those suitable for use by various industries in which the present invention may be beneficial. For example, in the cosmetic and personal care industry, the bio-1,2-alkanediol(s) formed according to the present invention can be used alone, in combinations of two or more such materials and/or with other biocompounds and/or with known cosmetic preservatives and alternative preservation materials and/or hurdle technology components. Examples of preservative materials are listed by the FDA in the U.S. as including: (i) traditional preservatives, such as parabens (methyl, ethyl, propyl, and butyl), Quaternium 15 (aka "Dowicil"), diazolidinyl urea, imidazolidinyl urea, DMDM hydantoin, 2-bromo-2-nitropropane-1,3-diol (aka "Bronopol"), sodium hydroxyglycinate, phenoxyethanol, sorbic acid, potassium sorbate, methylisothiazolinone (aka "MI"), methylchloroisothiazoline (aka "CMI" often in combination with MI as Kathon CG), sodium benzoate, caprylyl glycol, sodium dehydroacetate, and formaldehyde; (ii) non-traditional or alternative preservatives: such as extracts of botanicals, organic acids, alcohols and glycerols, fermentation products, glyceryl caprylate, levulinic acid, p-anisic acid, eucalyptus globulus, glycyrrhiza, glabra (licorice) root extract, salvia officinalis, citrus grandis (organic grapefruit) extract, arnica montana (organic arnica) extract, boraxitrus seed extracts, leuconostoc/radish root ferment filtrate. goldseal (hydrastis canadensis root extract), citrus medica, limonum (Lemon) peel extract, caprylhydroxamic acid; and (iii) so-called "self-preserving" materials such as ethanol (when present at > 15%), butylene glycol (when present at >10%), propylene glycol (when present at > 20%); as well as (iv) other components used in alternative or traditional preservation systems in cosmetics such as MDM hydantoin, sodium hydroxymethylglycinate, benzisothiazolinone, benzyl alcohol, dehydroacetic acid, benzoic acid, salicylic acid, iodopropynyl butylcarbamate chloroxylenol, methyldibromo glutaronitrile, chlorphenesin, triclosan, benzalkonium chloride,

chlorhexidine, polyaminopropyl biguanide, 5-bromo-5-nitro-1,3-dioxane (bronidox), hexamidine diisethionate, pentylene glycol, ethylhexylglycerin, triclocarban, glyceryl caprylate, o-cymen-5-ol, chlorphenesin, and glyceryl monolaurate, and traditional petrochemically-derived 1,2-alkanediols such as 1,2-hexanediol, 1,2-octanediol.

[0061] Other countries have similar lists with variations on the nature and type of preservatives, alternative preservatives or preservative system or hurdle technology additives that may be used in those countries. However, the present bio-1,2-alkanediols may be used in such other materials as well. In each of the above-noted systems and compositions, the preferred bio-alkene used in the invention is a bio-octene and the at least one first bio-1,2-alkanediol is bio-1,2-octanediol.

[0062] Examples of compositions that may benefit from an antimicrobial system incorporating one or more of the bio-1,2-alkanediols formed according to the process noted above and/or in compositions as noted above include personal care compositions, such as hair care, oral care, skin care or cosmetic compositions; household product compositions, such as fabric care or cleaning products; industrial compositions; and pharmaceutical, vitamin, nutraceutical or other health care compositions, any of which could benefit from an antimicrobial system, component or antimicrobial product derived from an authentic, natural, bio-based material.

[0063] The bio-1,2-alkanediols are preferably incorporated into a cosmetic or personal care composition (on a wet-basis or total weight basis) so as to make up about 0.001% by weight to about 25% by weight of the composition, and more preferably about 0.01% by weight to about 10% by weight of the composition. The amount used may vary depending on whether other hurdle technology components or other preservatives are also being used in the composition.

[0064] Such bio-1,2-alkanediols alone, in combinations of two or more different bio-1,2-alkandiols, and/or in antimicrobial systems incorporating the bio-1,2-alkanediol(s) alone or with other bio-compounds and/or other preservative, alternative preservative or hurdle technology components, may also be used in a method to provide an antimicrobial effect to a composition, wherein the compositions may be any of the variety of types of compositions as noted above. It is preferred that the bio-1,2-alkanediols herein provide an antimicrobial effect and efficacy to a composition into which the bio-1,2-alkanediols are incorporated, whether into a personal care, household, industrial, pharmaceutical, vitamin, nutraceutical or other health care composition. Such an antimicrobial effect may be demonstrated by using a variety of

suitable antimicrobial effectiveness tests (AET). Such tests include, for example, a compendial test performed during formulation development and stability testing in parenteral drug products intended as a multi-dose product. Suitable test procedures and acceptance criteria are described in the *U.S. Pharmacopeia*, AET, the *European Pharmacopeia* (Efficacy of Antimicrobial Preservation), and the *Japanese Pharmacopeia* (Preservation Effectiveness Tests). Other suitable challenge tests may be used. The FDA also recommends suitable challenge testing.

[0065] One group of antimicrobials, some of which are in the group noted above, are other alcohols, and preferably at least one other alcohol, preferably at least one other diol, and most preferably one or more other vicinal diols that may be petrochemically derived, albeit, it is preferred that such materials are used a diluents or in smaller amounts for providing some antimicrobial effect, but are not so great as to diminish the impact of the natural, bio-based 1,2-alkane diols of the present invention. By the term, "vicinal diols," it is meant materials that have hydroxyl groups which are bonded to atoms in the molecule which are next to each other, *i.e.*, wherein two atoms each bearing a hydroxyl group are bonded to each other. Examples of vicinal diol compounds suitable for use in the invention, include, but are not limited to, ethylene glycol and propylene glycol. Such materials are used in the personal care, cosmetic and pharmaceutical arts as humectants and solvents, and as described in U.S. Publication No. 2007-0207105-A1 as having some modest antimicrobial activity.

[0066] Preferred vicinal diols for use with the bio-1,2-alkanediols herein, in compositions described for use in personal care and pharmaceutical use compositions are medium-chain length, linear vicinal diols that demonstrate some antimicrobial activity including petrochemically-derived 1,2-pentanediol, 1,2-hexanediol, 1,2-octanediol, and 1,2-decanediol. Other vicinal diols useful in the compositions described herein include molecules derived from glycerin. Glycerin can be reacted with other molecules at its 1- or 3-position, leaving two vicinal hydroxyl groups. For example, glyceryl monoethers, such as ethylhexylglycerin [3-(2-ethylhexyloxy)propane-1,2-diol], available commercially as SENSIVA®SC50 from Schulke & Mayr, are useful, traditional, liquid vicinal diols having antimicrobial properties. Glyceryl monoesters such as glyceryl monolaurate, glyceryl mono caproate, or glyceryl monocaprylate, the latter of which is commercially available from Inolex Chemical Company, Philadelphia, PA, are also useful antimicrobial vicinal diols. For the preservation of cosmetics, toiletries and pharmaceuticals, vicinal diols are known to be effective against bacteria and yeast but weak

against fungi and to date there are only limited natural choices, none of which to applicant's knowledge are bio-derived natural 1,2-alkanediols of from 5 to 20 carbon atoms.

[0067] The compositions herein preferably do not include, or include only to a minor amount any preservation materials such as parabens, or other known preservation materials that can be viewed as harmful to the user.

[0068] Such personal care and pharmaceutical compositions may optionally further include a solubilizing agent in amounts of about 1% to about 70% by weight of the combination of the solubilizing material with the bio-1,2-alkane diol(s) (or if used with other preservation component(s) by weight of the entire antimicrobial system with the solubilizing material). Suitable solubilizing agents include vicinal and other traditional diols.

[0069] Also useful in with the bio-1,2-alkanediols in any antimicrobial system are hydroxamic acid and the like which may be used in a variety of industries. Suitable hydroxamic acids include alkylhydroxamic acids and bio-alkylhydroxamic acids that include at least one alkyl group of a chain length of about two to about twenty-two carbon atoms, which may be branched or linear in structure, substituted or unsubstituted, and saturated or unsaturated as noted hereinabove. Preferred alkylhydroxamic acids contain alkyl groups of a chain length of about six to about twelve carbon atoms and most preferably linear chains of that length. Most preferred alkylhydroxamic acids are caprylohydroxamic acid, having a linear terminal chain of eight carbon atoms and caprohydroxamic acid, having a linear chain of ten carbon atoms. Such alkylhydroxamic acids may be used alone or in combination and in amounts as noted above for an optional solubilizing agent.

[0070] Formulations prepared for personal care use, and pharmaceutical compositions, depending on the end use (topical or oral) may include any other colorants, fragrances, active ingredients or other additives typically used and/or to be developed in the art for use in personal care and pharmaceutical formulations, in which additives will vary depending upon the formulation in which the preferred bio-1,2-alkanediols, or antimicrobial products or systems containing the bio-1,2-alkanediols are used, for example, in topical skin toners, skin cleansers, night creams, skin creams, shaving creams, skin care lotions, or other cosmetic preparations; make-up, such as foundation, liquid and powder-based make-up, mascara, lipstick, blush, gloss, eye-liner and the like; or other personal care and/or pharmaceutical compositions, such as, sunscreens, lip balms, fragrances, massage oil, shampoos, conditioners, conditioning shampoos, hair styling gels, hair reparatives, hair tonics, hair fixatives, hair mousses, bath and shower gels,

liquid soaps, moisturizing sprays, makeup, pressed powder formulations, bath additives, ophthalmic preparations, foaming soaps and body washes, sanitizing wipes, hand sanitizers, medicaments (tablets or liquid), towelettes and wipes and others. It should be understood, based on this disclosure that a wide variety of personal care and pharmaceutical compositions could benefit from the properties of the bio-1,2-alkanediols of the present invention, wherein, as used herein, pharmaceutical composition is one having at least one active pharmaceutical ingredient (API).

[0071] The personal care and pharmaceutical formulations, if liquid based (such as gels, hydrogels, lotions, shampoos, liquid pharmaceuticals and the like) will also preferably include water as part of the liquid base. The formulations and compositions may include other additives as well depending on the end formulation desired, such as without limitation, at least one humectant, at least one emulsifier and/or thickener, chelating agent(s), gelling agent(s), amino acid(s), emollient(s), various solvents, free radicals and initiators, sunscreen UVA and/or UVB blocking agents, antioxidants, other preservatives, waxes, polymers and copolymers, inorganic and organic pigments and/or one more fragrances, favoring(s), coloring agent(s), herbs, natural extracts, essential oils, pharmaceutical drug products, other APIs and other additives commonly used in such formulations.

[0072] Personal care and pharmaceutical compositions using the bio-1,2-alkanediols herein may be lotion-based, oil-in-water emulsions, water-in-oil emulsions, water-in-silicone emulsions, silicon-in-water emulsions, gels, solids, liquids, cream based, oil based, aqueous/alcoholic or glycolic solution based, dispersions, suspensions or syrups, microemulsions or a liposome-based formulations.

[0073] In water-based formulations, other than solids and thicker gels, etc., it is preferred that about 20% by weight to about 95% by weight (on a wet basis) of water is incorporated therein. The various additives aside from the water and preferred antimicrobial systems noted herein, would make up the remaining portion of various personal care and pharmaceutical compositions. Preferably, each additive is present in an amount of up to about 75 percent by weight of the entire formulation, and more preferably up to about 40 percent by weight, with a collective amount of such additives of preferably no greater than about 50 percent by weight.

[0074] In a household product, antimicrobials are also useful additives. Household product compositions can include household cleaners as well as fabric care compositions. Cleaning compositions (whether solids or solutions) can incorporate cleaning agents that are active

ingredients for cleaning (bleach, vinegar, ammonia, citric acid and the like). For liquid cleaning agents, aqueous solutions may be used as are known in the art or to be developed, such as quaternary ammonium compounds, bleach, vinegar, or basic or acidic cleansers. Commercially available quaternary ammonium-based cleaning products include various antibacterial all purpose cleaners among others which are intended and well-suited for sanitizing or disinfecting efficacy, however, such compositions still incorporate antimicrobials and other preservatives for shelf life and to prevent growth of foreign agents. Thus such compositions also benefit from use of the natural bio-1,2-alkanediols herein.

[0075] For more natural cleaning solutions, such as citric acid-based agents or other green cleaning agents (ecologically friendly), consumers would be interested in further additives that are also natural, and in this case that are derived from a biological source. Thus, such compositions benefit from natural bio-based 1,2-alkanediols herein as well as antimicrobial systems and products incorporating the bio-1,2-alkanediols. Such natural cleaning compositions as well as standard cleaning compositions as noted above may also incorporate various optional additives in varying amounts as noted below. Citric acid-based clearning products may include lemon, orange or grapefruit-based cleaning agents. Other suitable components may include grape seed oil, vegetable oils combined with one or more of mild peroxide agents, surfactants, and the like, as well as pigment(s) or colorant additive(s) to provide a visual alerts when the cleaners are present, conventional or alternative preservation compound(s), antimicrobial(s), bactericide(s) or fungicide(s) (each of which may be used along or in combination with the bio-1,2 alkanediols of the present invention in an antimicrobial system or product), thixotropic agents and rheological modifiers, pH adjusting additives or buffers, as well as fragrance additive(s) for providing a clean smell (pine scent, lemon scent, orange scent, floral scent, etc.). In addition, other agents for foaming, color change or effervescence (bubbling) may be provided if desired to demonstrate cleaning action. Solid cleaners can incorporate similar additives, but can be compressed, incorporated or formed from depositing a cleaning material on a substrate (sponge, scrubber, mop head or the like), and various inactive agents for holding the solid cleaning material together (hardeners, gelling agents, mineral powder and the like). Other additives for household cleaning compositions may include pH buffering agent(s), a fragrance encapsulate(s) or carrier(s), fluoroescer(s), hydrotrope(s), soil-release agent(s), polyelectrolyte(s), enzyme(s), optical brightening agent(s), anti-oxidant(s), UV absorbing compound(s), propylene glycol, dipropylene glycol, opacifier(s),

pearlescent(s) and combinations of these as well as other cleaning product additives known or to be developed.

[0076] The fabric care compositions can include any active fabric cleaning component as well as various conditioning components as are known or to be developed in the art. Such compositions may include ingredients used for fabric cleaning or laundering, fabric conditioning or softening, fabric dye(s), water conditioner(s) and/or fabric care composition(s) such as spot removers or stain treatments. Such ingredients include without limitation antifoam agent(s), antidepositon agent(s), fragrance(s) and their carrier(s) or encapsulate(s), traditional or conventional diols (although such diols may be omitted if the bio-1,2-alkanediols are useful in the same or an enhanced or boosted capacity for an existing diol), colorant(s) such as pigment(s) or dye(s), and co-softening agent(s). Others additives for fabric care compositions may include, without limitation, other traditional preservative(s), antimicrobial(s), bacteriocide(s), and/or fungicide(s)(each of which may be used alone or in an antimicrobial product or system as described herein), pH modifier(s) or buffering agent(s), fluoroescer(s), hydrotrope(s), soil-release agent(s), polyelectrolyte(s), enzyme(s), optical brightening agent(s), anti-shrinking agent(s), anti-wrinkle agent(s), anti-spotting agent(s), anti-oxidant(s), UV absorbing compound(s), anti-corrosion agent(s), drape imparting agent(s), anti-static agent(s), ironing aid(s), odor-preventing compound(s), perfume encapsulate(s), cotton seed oil, tea tree oil, aloe vera extract, propylene glycol, dipropylene glycol, opacifier(s), pearlescent(s) and combinations of these components.

[0077] The antimicrobial bio-1,2-alkanediols herein may also be used in the treatment of the finished textile(s) and/or treatment of the fibers or yarns from which a textile is to be fabricated to achieve the desired benefit. Textiles may include woven and non-woven textiles, such as felt and tapa cloth and other bark cloths, or blends and combinations of the same. Textile fiber (whether it exists in finished textile form, yarn or fiber form) may be any known or developed in the art and include synthetic fibers, "natural" fibers, such as animal derived fibers or cellulosic/plant-derived fibers and blends or combinations of any of these.

[0078] Animal-derived fibers may include and derived from the hairs or fur of an animal. Examples are, without limitation, lambs or sheep's wool, alpaca, angora wool, azlon, byssus, camel hair, cashmere wool, chiengora, chatgora, llama, mohair wool, qiviut, rabbit, silk, vicuna, yak, pashmina wool and combinations of the same. Cellulosic or plant-derived fibers may include, without limitation, those obtained from flax (linen fibers), cotton, ramie, jute, kenaf,

beach hibiscus, roselle, urena, hemp (e.g., *Crotalaria juncea*, *Cannabis sativa*, *Apocynum cannabinum*), hoop vine, sisal, henequen, yucca, abaca, genus *Sansevieria*, New Zealand flax, cotton, coir, milkweed, kapok, floss silk, *Proboscidea parviflora*, bamboo, bast, fique, banana, modal, lyocell, pina, raffia, rayon, soy protein, acetate and combinations of the same. Synthetic fibers may include any known or to be developed, such as for example, and without limitation, acrylic, Kevlar®, modacrylic, Nomex®, nylon, polyester, lycra, spandex, rayon, and combinations of the same.

[0079] Fabric treatment compositions may be applied to the textile or fibers. The compositions may be applied as either a wet or dry compositions, and during a laundering cycle with water or a drying cycle. Such fabric treatment materials may be used for softening and/or conditioning a textile or fiber; reducing and/or preventing wrinkles, imparting a fragrances to a textile or fiber; reducing ironing time, improving softness and the like.

[0080] The invention also incorporates use of the 1,2-bio-alkanediol materials formed according to the invention as a material for boosting the antimicrobial efficiency of existing antimicrobials, preservatives, alternative preservation materials and/or hurdle technologies.

[0081] By boosting the antimicrobial efficacy, it is meant that the antimicrobial efficacy of an existing antimicrobial and/or preservative (including alternative preservation materials or hurdle technologies) when combined with the 1,2-bio-alkandiols achieve an improvement of antimicrobial effectiveness that is more than insubstantial, i.e., at least about 5%, preferably at least about 10%, and more preferably at least about 20% or more improvement, while providing a natural boosting material. Boosting effects and antimicrobial effects in a formulation are evaluated by measuring performance using a preservative efficacy test ("PET") or a challenge test. Preservatives and antimicrobials used in cosmetic, toiletry and pharmaceutical products must enable the products to successfully pass microbiological testing protocols, known as "challenge tests," established by government regulations and trade organizations. Challenge tests are performed by adding known quantities of microorganisms to a product and measuring the increase or decrease in microorganism population over time. The organisms include Gram-positive bacteria, Gram-negative bacteria, yeast and mold. The Cosmetic, Toiletries, and Fragrance Association (CTFA) has defined a challenge test that is widely accepted as the standard in the cosmetic, toiletry and pharmaceutical industry. The test requires that the quantity of bacteria be reduced by 99% in seven days, and that the quantity of yeast and fungi (mold) be reduced by 90% in seven days. In order to pass a challenge test, the product must

contain the appropriate amounts and types of preservative compounds that will enable antimicrobial efficacy against a broad spectrum of microorganisms in a short period of time.

[0082] In addition to the content noted to provide antimicrobial efficacy, if using as a boosting material to improve the effectiveness of an existing antimicrobial and the like as noted above it is preferred that the 1,2-bioalkanediol(s) are incorporated in an amount of about 0.1 to about 10 weight percent, and preferably 5.0 to about 3.0 weight percent, of the total composition; and in a ratio of about 99.999:0.001 to about 0.001:99.999, and preferably about 99.9:0.1 to about 0.1:99.9 of the total amount of existing antimicrobial, preservative, alternative preservation and/or hurdle technology components already existing in the composition.

[0083] The invention will now be described with respect to the following non-limiting examples:

EXAMPLES

[0084] A 1-octanol is formed from the hydrogenation of octanoic acid derived from coconut, palm or any other plant source including biomass that can produce octanoic acid. The octanol is dehydrated regioselectively by feeding the 1-octanol at an elevated temperature into a fixed bed reactor.

EXAMPLE 1

[0085] In one trial, bio-1-octanol was fed into a 75 mL reactor packed with catalyst. It was fed a rates of about 0.1 to about 5.0 ml/min. The temperature used ranged from about 200°C to about 400°C. The reactor was a 75 ml sample bomb (Sigma Aldrich Part No. Z173592). The reactor was packed with various catalysts for experimental trials including: 1.) a sodium hydroxide treated alumina catalyst; 2) a catalyst as in (1) but treated with dichlorphenylsilane; 3) a calcium acetate treated alumina catalyst; and 4) a catalyst as in (3) treated further with diethoxydiphenylsilane.

[0086] In this Example, catalyst three was used in the reactor was wrapped with heating tape and the temperature was controlled by affixing a thermocouple attached to a temperature controller. Bio-1-octanol was fed into the reactor using an HPLC pump. In trials using a bio-1-octanol heated to 315°C, and fed at a rate of 0.30 ml/min, and heating the catalyst to 350°C, for a run time of 30.01 min., bio-1-octene was formed having a an area shown in the gas chromatograph of 1-octene (93.32%); 2-octene-trans (1.54%); 2-octene-cis (3.62%) and 3-octene (0.15%). The total octene conversion was 98.63%. The regioselectivity is measured as

the yield of the desired terminal compound to the total isomers (i.e., 93.32/98.63 X 100) giving a regioselectivity for the terminal bio-1-octene of 94.61%. The gas chromatograph results for this example is shown in Fig. 1.

[0087] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.

CLAIMS

I claim:

1. A process for the synthesis of bio-1,2-alkanediols, comprising:

providing a bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%;

converting the bio-alkene to a bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms.

2. The process of claim 1, wherein the bio-alkene and the bio-1,2-alkanediol each have a carbon chain of about 6 to about 14 carbon atoms.

3. The process according to claim 2, wherein the bio-alkene and the bio-1,2-alkanediol each have a carbon chain length of about 6 to 10 carbon atoms.

4. The process according to claim 1, wherein the bio-alkene is bio-octene and the bio-1,2-alkane diol is bio-1,2-octanediol.

5. The process according to claim 1, wherein the bio-alkene results from a process wherein a bio-1-alcohol is dehydrated by heating the bio-1-alcohol and passing it through a fixed bed reactor packed with a catalyst.

6. The process according to claim 5, wherein the catalyst is selected from an alumina-based catalyst treated with a base, $ZnAl_2O_4$; or an γ-alumina catalyst modified by reaction with a base.

7. The process according to claim 6, wherein the bio-alkene has a terminal bio-1-alkene regioselectivity of about 92% to about 99%.

8. The process according to claim 7, wherein the process yields at least about 92% to about 99% of the bio-1,2-alkanediol.

9. The process according to claim 1, wherein the bio-alkene results from a process wherein the bio-1-alcohol in water is dehydrated by heating the bio-1-alcohol with a catalyst under a purge gas.

10. The process according to claim 1, wherein the bio-alkene is converted to the bio-1,2-alkanediol by reacting the bio-alkene in the presence of at least one of formic acid or acetic acid and a peroxide to form a bio-1,2-epoxyalkane having an epoxy ring, and contacting the 1,2-epoxyalkane with water and sodium hydroxide to form the bio-1,2-alkanediol.

11. The process according to claim 1, wherein the bio-alkene is formed by dehydrating a bio-1-alcohol using heat and an acid catalyst.

12. The process according to claim 1, wherein the process yields at least about 80% to about 99% of the bio-1,2-alkanediol.

13. The process according to claim 12, wherein the process yields at least about 92% to about 99% of the bio-1,2-alkanediol.

14. A composition, comprising at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

15. The composition according to claim 14, wherein the composition is a personal care composition.

16. The composition according to claim 15, wherein the personal care composition is a hair care composition, an oral care composition, a skin care composition or a cosmetic composition.

17. The composition according to claim 14, wherein the composition is a composition for a household product.

18. The composition according to claim 17, wherein the household product is a fabric care product or a cleaning product.

19. The composition according to claim 14, wherein the composition is an industrial composition.

20. The composition according to claim 14, wherein the composition is a pharmaceutical composition, a vitamin composition, or a health care composition.

21. The composition according to claim 14, comprising a second bio-1,2-alkanediol, different than the first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a second bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

22. The composition according to claim 21, wherein the composition further comprises at least one other bio-compound different from the first and the second bio-1,2-alkanediols.

23. The composition according to claim 22, wherein the composition comprises an antimicrobial compound different from the first and the second bio-1,2-alkanediol and different from the other bio-compound.

24. The composition according to claim 14, wherein the composition further comprises at least one other bio-compound different from the at least one bio-1,2-alkanediol.

25. The composition according to claim 24, wherein the composition comprises at least one antimicrobial compound different from the at least one bio-1,2-alkanediol and different from the other bio-compound.

26. The composition according to claim 14, wherein the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

27. The composition according to claim 14, wherein the first bio-alkene is bio-octene and the at least one first bio-1,2-alkane diol is bio-1,2-octanediol.

28. A method for providing an antimicrobial effect to a composition, including incorporating an antimicrobial system to the composition, wherein the antimicrobial system comprises at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of at least one first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

29. The method according to claim 28, wherein the antimicrobial system further comprises a second bio-1,2-alkanediol different than the first bio-1,2-alkanediol, wherein the first bio-1,2-alkanediol has a carbon chain length of about 5 to about 20 carbon atoms and is formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

30. The method according to claim 29, wherein the composition further comprises at least one other bio-compound different from the first and the second bio-1,2-alkanediols.

31. The method according to claim 30, wherein the antimicrobial system comprises at least one other preservative compound different from the first and the second bio-1,2-alkanediol and different from the other bio-compound.

32. The method according to claim 28, wherein the composition further comprises at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

33. The method according to claim 32, wherein the antimicrobial comprises at least one other antimicrobial compound and/or preservative compound different from the at least one first bio-1,2-alkanediol and different from the other bio-compound.

34. The method according to claim 28, wherein the antimicrobial system demonstrates antimicrobial efficacy.

35. The method according to claim 28, wherein the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

36. The method according to claim 28, wherein the first bio-alkene is bio-octene and the at least one first 1,2-alkane diol is bio-1,2-octanediol.

37. A method for boosting the antimicrobial efficiency of an antimicrobial and/or a preservative in a composition, comprising incorporating an antimicrobial system into the composition, wherein the second antimicrobial system comprises at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

38. The method according to claim 37, wherein the antimicrobial system further comprises a second bio-1,2-alkanediol different than the first bio-1,2-alkanediol, wherein the second bio-1,2-alkanediol has a carbon chain length of about 5 to about 20 carbon atoms and is formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

39. The method according to claim 38, wherein the composition further comprises at least one other bio-compound different from the antimicrobial and/or preservative and different from the first and the second bio-1,2-alkanediols.

40. The method according to claim 37, wherein the composition further comprises at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

41. The method according to claim 37, wherein the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

42. The method according to claim 37, wherein the antimicrobial system demonstrates antimicrobial efficacy.

43. The method according to claim 37, wherein the first bio-alkene is bio-octene and the at least one first bio-1,2-alkane diol is bio-1,2-octanediol.

44. An antimicrobial product, comprising at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of

a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

45. The antimicrobial product according to claim 44, further comprising a second bio-1,2-alkanediol, different than the at least one first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms and formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

46. The antimicrobial product according to claim 45, wherein the product further comprises at least one other bio-compound different from the at least one first and the second bio-1,2-alkanediols.

47. The antimicrobial product according to claim 46, further comprising a second antimicrobial and/or a preservative different from the antimicrobial product.

48. The antimicrobial product according to claim 44, wherein the product further comprises at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

49. The antimicrobial product according to claim 48, further comprising a second antimicrobial and/or a preservative different from the antimicrobial product.

50. The antimicrobial product according to claim 44, wherein the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

51. The antimicrobial product according to claim 44, wherein the antimicrobial product demonstrates antimicrobial efficacy.

52. The antimicrobial product according to claim 44, wherein the first bio-alkene is bio-octene and the at least one first 1,2-alkane diol is bio-1,2-octanediol.

53. A product for boosting the efficacy of an antimicrobial and/or a preservative in a composition, the product comprising at least one first bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms which is synthesized by conversion of a first bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

54. The product according to claim 53, further comprising a second bio-1,2-alkanediol, different than the at least one first bio-1,2-alkanediol, the second bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms and formed by conversion of a second bio-alkene, different than the first bio-alkene, having a carbon chain length of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%.

55. The product according to claim 54, wherein the composition further comprises at least one other bio-compound different from the at least one first and the second bio-1,2-alkanediols.

56. The product according to claim 53, wherein the product further comprises at least one other bio-compound different from the at least one first bio-1,2-alkanediol.

57. The product according to claim 53, wherein the first bio-1-alkene has a regioselectivity of about 92% to about 99%.

58. The product according to claim 53, wherein the first bio-alkene is bio-octene and the at least one first bio-1,2-alkane diol is bio-1,2-octanediol.

59. The product according to claim 53, wherein the product demonstrates antimicrobial efficacy.

ABSTRACT OF THE DISCLOSURE

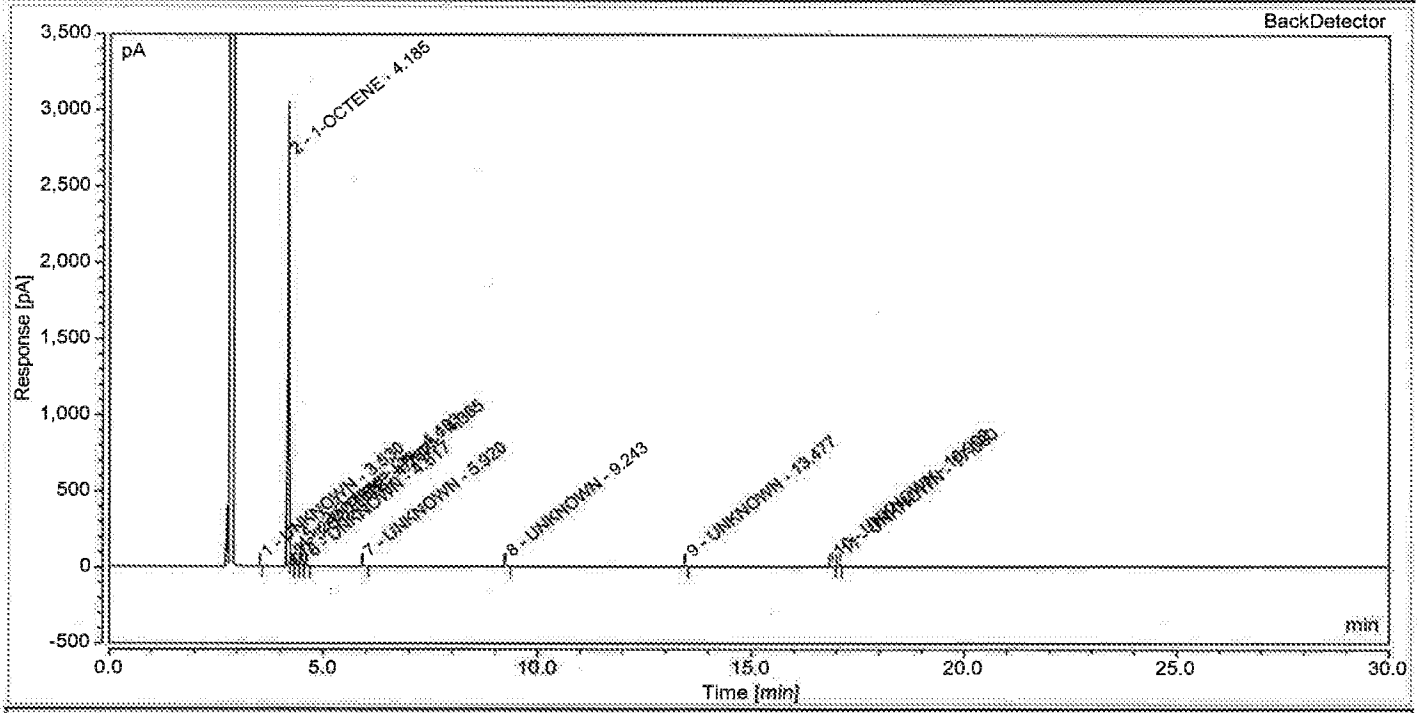
A process is incorporated herein for the synthesis of bio-1,2-alkanediols, comprising: providing a bio-alkene having a carbon chain of about 5 to about 20 carbon atoms and a terminal bio-1-alkene regioselectivity of at least about 80%; and converting the bio-alkene to a bio-1,2-alkanediol having a carbon chain length of about 5 to about 20 carbon atoms. Such materials are used in compositions and products alone as antimicrobial materials, or with existing bio-compounds and/or antimicrobials, preservatives, alternative preservation systems and/or hurdle technology components. The bio-1,2-alkanediols incorporate a natural and bio-based pathway for antimicrobial effects in various compositions such as cosmetic, pharmaceutical, industrial and household products.

Chromatogram and Results

Injection Details

Injection Name:	Example 1 - 315C, 0.3 ml/min.	*Run Time (min):*	30.01
Vial Number:	46	*Injection Volume:*	1.00
Injection Type:	Unknown	*Channel:*	BackDetector
Calibration Level:		*Wavelength:*	n.a.
Instrument Method:	OCTENE FID LIQ. METHOD	*Bandwidth:*	n.a.
Processing Method:	OCTENE Processing Method	*Dilution Factor:*	1.0000
Injection Date/Time:		*Sample Weight:*	1.0000

Chromatogram



Integration Results

No.	Peak Name	Retention Time min	Area pA*min	Height pA	Relative Area %	Rel.Amount (TOTAL) %
1	UNKNOWN	3.530	0.005	0.111	0.00	0.00
2	1-OCTENE	4.185	105.738	2956.993	93.32	91.22
3	3-OCTENE	4.287	0.172	4.632	0.15	0.15
4	2-OCTENE - Trans	4.365	1.745	46.986	1.54	2.21
5	2-Octene - Cis	4.483	4.101	106.084	3.62	5.19
6	UNKNOWN	4.617	0.142	3.507	0.13	0.11
7	UNKNOWN	5.920	0.153	2.906	0.13	0.12
8	UNKNOWN	9.243	0.267	4.832	0.24	0.21
9	UNKNOWN	13.477	0.142	4.290	0.12	0.11
10	UNKNOWN	16.902	0.333	9.883	0.29	0.26
11	UNKNOWN	17.080	0.509	14.959	0.45	0.40
Total:			**113.305**	**3155.182**	**100.00**	**100.00**

FIGURE 1

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols and Methods of Making Same
First Named Inventor/Applicant Name:	Rocco V. Burgo
Filer:	lynda Leigh Calderone
Attorney Docket Number:	I0113-198US

Filed as Large Entity

Filing Fees for Provisional

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PROVISIONAL APPLICATION FILING	1005	1	280	280
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**280**

Electronic Acknowledgement Receipt

EFS ID:	31652130
Application Number:	62623985
International Application Number:	
Confirmation Number:	4894
Title of Invention:	Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols and Methods of Making Same
First Named Inventor/Applicant Name:	Rocco V. Burgo
Customer Number:	54380
Filer:	lynda Leigh Calderone
Filer Authorized By:	
Attorney Docket Number:	I0113-198US
Receipt Date:	30-JAN-2018
Filing Date:	
Time Stamp:	18:32:21
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$280
RAM confirmation Number	013118INTEFSW18373800
Deposit Account	503541
Authorized User	Lynda Calderone

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37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	transmit.PDF	116868 e275b42148568f86565cf7d2406cac34314914ec	no	1
Warnings:					
This is not a USPTO supplied Provisional Cover Sheet SB16 form.					
Information:					
2	Application Data Sheet	ADS.PDF	1835639 32c7346401c1b7a6521fbc6e14f550e5b2e0b8eb	no	8
Warnings:					
Information:					
3		provisional.pdf	425245 189aaf39d13c253e62d1508968aa12f8e84fd241	yes	32

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	25
Claims	26	31
Abstract	32	32

Warnings:					
Information:					
4	Drawings-only black and white line drawings	figure.PDF	142715 d7a472aa8b6e97a1fbcfbc8cd5f26c3f95e34345	no	1
Warnings:					
Information:					

5	Fee Worksheet (SB06)	fee-info.pdf	30174 4632733cc94ca434a9b522e737890674ce9c61ff	no	2

Warnings:

Information:

Total Files Size (in bytes):	2550641

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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.
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.