



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
63/229,817	08/05/2021		300	210189P		

CONFIRMATION NO. 9678

FILING RECEIPT



CC000000127643710

26285
K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

Date Mailed: 08/12/2021

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 FIRST INVENTOR, 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 corrected Filing Receipt identifying the requested changes, preferably by including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Min Kuang, Peachtree City, GA;
Jun Zhang, Peachtree City, GA;

Applicant(s)

Koppers Performance Chemicals, Inc., Pittsburgh, PA;

Power of Attorney:

William Kuss--41919

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: 08/11/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 63/229,817**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

WOOD PRESERVATIVE COMPOSITION COMPRISING
4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE
THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

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

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where

the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

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

SelectUSA

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

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

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Priority Mail Express® Label No. _____

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Min	Kuang	Peachtree City, GA
Jun	Zhang	Peachtree City, GA

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

TITLE OF THE INVENTION (500 characters max):

 A WOOD PRESERVATIVE COMPOSITION COMPRISING
 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD
 SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Direct all correspondence to: **CORRESPONDENCE ADDRESS**
☒ The address corresponding to Customer Number: 26285

OR
☐ Firm or Individual Name
 Address
 City State Zip
 Country Telephone Email

ENCLOSED APPLICATION PARTS (check all that apply)
☒ Application Data Sheet. See 37 CFR 1.76. ☐ CD(s), Number of CDs _____
☐ Drawing(s) Number of Sheets _____ ☐ Other (specify) _____
☒ Specification (e.g., description of the invention) Number of Pages 33

Fees Due: Filing Fee of \$300 (\$150 for small entity) (\$75 for micro entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$420 (\$210 for small entity) (\$105 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT
☐ Applicant asserts small entity status. See 37 CFR 1.27.
☐ Applicant certifies micro entity status. See 37 CFR 1.29.
 Applicant must attach form PTO/SB/15A or B or equivalent.
☐ A check or money order made payable to the *Director of the United States Patent and Trademark Office* is enclosed to cover the filing fee and application size fee (if applicable).
☒ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit Account Number: 02-1818.

\$300.00

TOTAL FEE AMOUNT (\$)

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 10 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 2 of 2

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government. (NOTE: Providing this information on a provisional coversheet, such as this Provisional Application for Patent Cover Sheet (Form PTO/SB/16), does not satisfy the requirement of 35 U.S.C. 202(c)(6), which requires that the *specification* contain a statement specifying that the invention was made with Government support and that the Government has certain rights in the invention.)



No.



Yes, the invention was made by an agency of the U.S. Government. The U.S. Government agency name is:



Yes, the invention was made under a contract with an agency of the U.S. Government.

The contract number is: _____

The U.S. Government agency name is: _____

In accordance with 35 U.S.C. 202(c)(6) and 37 CFR 401.14(f)(4), the specifications of any United States patent applications and any patent issuing thereon covering the invention, including the enclosed provisional application, must state the following:

“This invention was made with government support under [IDENTIFY THE CONTRACT] awarded by [IDENTIFY THE FEDERAL AGENCY]. The government has certain rights in the invention.”

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

SIGNATURE /William E. Kuss/ DATE August 5, 2021
TYPED OR PRINTED NAME William E. Kuss REGISTRATION NO. 41,919
(if appropriate)
TELEPHONE (412) 355-6323 DOCKET NUMBER 210189P

Privacy Act Statement

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

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

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

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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		
<p>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.</p> <p>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.</p>			

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		
	Min		Kuang			
Residence Information (Select One) • US Residency Non US Residency Active US Military Service						
City	Peachtree City	State/Province	GA	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	222 Lenox Dr.					
Address 2						
City	Peachtree City	State/Province	GA			
Postal Code	30269	Country	US			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Jun		Zhang			
Residence Information (Select One) • US Residency Non US Residency Active US Military Service						
City	Peachtree City	State/Province	GA	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	234 Independence Lane					
Address 2						
City	Peachtree City	State/Province	GA			
Postal Code	30269	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						
Add						

Correspondence Information:

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

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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

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

Customer Number	26285		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		
Attorney Docket Number	210189P	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	

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	26285		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

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	<input type="text"/>	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
<input type="text"/>	<input type="text"/>		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			<input type="button" value="Add"/>

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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	<input type="button" value="Remove"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	Access Code ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			<input type="button" value="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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

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		<input type="button" value="Remove"/>	
<p>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.</p>			
		<input type="button" value="Clear"/>	
☒ Assignee		Legal Representative under 35 U.S.C. 117	
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:			
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; width: 400px; height: 20px;"></div>			
If the Applicant is an Organization check here. ☒			
Organization Name		Koppers Performance Chemicals, Inc.	
Mailing Address Information For Applicant:			
Address 1		436 Seventh Avenue	
Address 2			
City		Pittsburgh	State/Province
Country		US	PA
Postal Code		15219	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. <input type="button" value="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.

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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
<div>Remove</div>				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1		<input type="text"/>		
Address 2		<input type="text"/>		
City	<input type="text"/>	State/Province	<input type="text"/>	
Country ⁱ	<input type="text"/>	Postal Code	<input type="text"/>	
Phone Number	<input type="text"/>	Fax Number	<input type="text"/>	
Email Address	<input type="text"/>			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. <div>Add</div>				

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	William E. Kuss/			Date (YYYY-MM-DD)	2021-08-05
First Name	William	Last Name	Kuss	Registration Number	41,919
Additional Signature may be generated within this form by selecting the Add button. <div>Add</div>					

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	210189P
		Application Number	
Title of Invention	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		

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

Privacy Act Statement

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

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

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

TITLE

A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

FIELD

[0001] The present disclosure relates to a wood preservative composition comprising 4,5-dichloro-2-octylisothiazol-3(2H)-one, a method of treating a wood substrate therewith, and a wood product produced therefrom.

BACKGROUND

[0002] Oil-borne preservatives, such as, for example, pentachlorophenol (Penta) in hydrocarbon solvent carriers have been used as heavy-duty industrial wood preservative to treat, for example, utility poles for many decades. Oil-borne preservatives comprising Penta may impart treated wood with excellent resistance to wood decay fungi and termites as well as potentially desirable climbability, electrical resistance, and inhibition of corrosion of hardware. However, in 2015, the Stockholm Convention classified Penta as a persistent organic pollutant (POP) and proposed to ban its use. In 2019, the only North American producer of Penta made an announcement that they will shut down their Penta manufacturing plant and a blending facility by the end of 2021 in order to enforce the implementation the Stockholm Convention. In March 2021, the EPA made a proposal to ban the use of Penta. Therefore, an alternative oil-borne preservative to oil-borne preservatives comprising Penta is desired.

SUMMARY

[0003] The present disclosure provides a wood preservative composition comprising an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. A weight ratio of the DCOI to the retaining additive in the composition is in a range of 1:5 to 5:1. The polymeric resin has a solubility in the organic solvent of at least 0.5%.

[0004] The present disclosure also provides a method of treating a wood substrate. The method comprises contacting the wood substrate with a wood preservative composition for a period of time suitable to inhibit fungal decay of the wood substrate. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. A weight ratio of the DCOI to the retaining additive in the composition is in a range of 1:5 to 5:1. The polymeric resin has a solubility in the organic solvent of at least 0.5%.

[0005] The present disclosure also provides a wood product produced by treating a wood substrate with a wood preservative composition. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. A weight ratio of the DCOI to the retaining additive in the composition is in a range of 1:5 to 5:1. The polymeric resin has a solubility in the organic solvent of at least 0.5%.

[0006] The present disclosure also provides a wood product comprising a wood preservative composition. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. A weight ratio of the DCOI to the retaining additive in the composition is in a range of 1:5 to 5:1. The polymeric resin has a solubility in the organic solvent of at least 0.5%.

[0007] The present disclosure also provides a wood preservative composition for application to a wood product. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. The retaining additive is present in the wood preservative composition in an amount sufficient such that when applied to the wood product, the wood product leaches less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive.

[0008] The present disclosure also provides a wood preservative composition for application to a wood product. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. The retaining additive is present in the wood preservative composition in an amount sufficient such that when applied to the wood product, less DCOI is dislogeable from a surface of the treated wood product after 72 hours as measured by wiping with a polyester wipe 9 times across the surface of the wood product than a comparative surface of a comparative wood product treated with a comparative composition without the retaining additive.

[0009] It is understood that the inventions described in this specification are not limited to the examples summarized in this Summary. Various other aspects are described and exemplified herein.

DETAILED DESCRIPTION

[0010] Certain exemplary aspects of the present disclosure will now be described to provide an overall understanding of the principles of the structure, function, manufacture, and use of the compositions, methods, and products disclosed herein. One or more examples of these aspects are illustrated in the accompanying drawings. Those of ordinary skill in the art will understand that the devices and methods specifically described herein and illustrated in the accompanying drawings are non-limiting exemplary aspects and that the scope of the various examples of the present disclosure is defined solely by the claims. The features illustrated or described in connection with one exemplary aspect may be combined with the features of other aspects. Such modifications and variations are intended to be included within the scope of the present disclosure.

[0011] Any references herein to “various examples,” “some examples,” “one example,” “an example,” similar references to “aspects,” or the like, means that a particular feature, structure, or characteristic described in connection with the example is included in at least one example. Thus, appearances of the phrases “in various examples,” “in some examples,” “in one example,” “in an example,” similar references to “aspects,” or the like, in places throughout the specification are not necessarily all referring to the same example. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more examples. Thus, the particular features, structures, or characteristics illustrated or described in connection with one example may be

combined, in whole or in part, with the features, structures, or characteristics of one or more other examples without limitation. Such modifications and variations are intended to be included within the scope of the present examples.

[0012] 4,5-dichloro-2-octylisothiazol-3(2H)-one (DCOI) has been used in wood preservative compositions for mold control and antibacterial activity. DCOI dissolved in hydrocarbon solvents has also been proposed to treat wood for heavy duty applications. However, wood products treated with DCOI in solvents alone composition may produce more surface dislodgeable material and may not desirably be leach resistant when exposed outdoor over time. Thus, the present disclosure provides a wood preservative composition comprising DCOI, an organic solvent, and a retaining additive that the present inventors surprisingly discovered can increase the leach resistance of DCOI in wood products and reduce surface dislodgeable materials over time.

[0013] DCOI ($C_{10}H_{15}Cl_2NOS$) is an organic compound biocide that can inhibit fungal decay and/or insect attack of a wood product. Thus, the concentration of the DCOI in the wood preservative composition according to the present disclosure can be selected based on the desired level of inhibition of the fungal decay and/or insect attack, and/or based on the method used to treat the wood product. For example, the wood preservation composition according to the present disclosure can comprise a concentration of DCOI of at least 0.5 % by weight based on the total weight of the composition, such as, for example, at least 1.0 % by weight, at least 2.0 % by weight, at least 2.5 % by weight, or at least 3.0 % by weight, all based on the total weight of the composition. The wood preservation composition according to the present disclosure can comprise a concentration of DCOI no greater than 10 % by weight based on the total weight of the composition, such as, for example, no greater than 9 % by weight, no greater than 8 % by weight, no greater than 5 % by weight, no greater than 4 % by weight, or no greater than 3 % by weight, , all based on the total weight of the composition. In various examples, the wood preservative composition according to the present disclosure can comprise a concentration of DCOI in a range of 0.5 % by weight to 10 % by weight based on the total weight of the composition, such as, for example, 1.0 % by weight to 5.0 % by weight, 1.5 % by weight to 5.0 % by weight, 1.5 % by weight to 3.0 % by weight, 2.0 % by weight to 3.0% by weight, 2.0 % by weight to 2.5 % by weight, 1.5 % by weight to 2.0 % by weight, all based on the total weight of the composition. For example, the wood preservative composition

according to the present disclosure can comprise 2 % by weight DCOI based on the total weight of the composition.

[0014] The organic solvent can facilitate solubilization of the DCOI and/or the retaining additive and/or the penetration of the DCOI into a wood product. For example, DCOI can comprise a solubility of 2% in the organic solvent, such as, for example, at least 5% in the organic solvent. The organic solvent can comprise one solvent, or a mixture of two or more solvents based on the application and/or desired properties of the organic solvent. The organic solvent can comprise a hydrocarbon solvent (e.g., diesel #2, diesel #4, diesel #6, an aliphatic solvent), an amine solvent, a glycol solvent, a ketone solvent, an ester solvent, an alcohol solvent, a halogenated solvent, a terpene solvent, an aromatic solvent, a biodegradable organic solvent, or a combination thereof.

[0015] When employed in wood preservative composition according to the present disclosure the hydrocarbon solvent can comprise various hydrocarbon classes and chain lengths. For example, the hydrocarbon solvent can be a hydrocarbon solvent as defined in American Wood Protection Association (AWPA) 2021 Book of Standards HSA-18, HSC-17, HSF-17, HSG-18, HSH-18, or a combination thereof. The chain length and hydrocarbon classes of the hydrocarbon solvents suitable for use with the present disclosure can be selected to achieve a desired flash point of the composition and/or solubility of the DCOI and/or retaining additive. For example, the organic solvent can comprise a hydrocarbon solvent, such as, for example, diesel. The organic solvent can comprise a flash point of at least 20 degrees Celsius, such as, for example, at least 50 degrees Celsius or at least 60 degrees Celsius, at least 70 degrees Celsius, at least 80 degrees Celsius, at least 90 degrees Celsius, at least 100 degrees Celsius, at least 110 degrees Celsius, at least 120 degrees Celsius, at least 150 degrees Celsius, or at least 200 degrees Celsius. The hydrocarbon solvent can be derived from petroleum based products.

[0016] The aliphatic solvent can comprise, Heptane, Hexane, Kerosene, Lacquer Diluent, Mineral Seal Oil, #2 fuel oil, Mineral Spirits, n-Pentane, OMS-Odorless Mineral Spirits, Rubber Solvent, 140 Solvent, 360 Solvent, Textile Spirits.RTM., VM&P, or a combination thereof.

[0017] The amine solvent can comprise Diamylamine, Diethylamine, Diisopropylamine, Dimethylethylamine, Di-n-Butylamine, Mono-2-Ethylhexylamine, Monoamylamine, Monoethylamine 70%, Monoisopropylamine, Anhy., Mono-n-Butylamine, Triamylamine,

Triethylamine, Tri-n-Butylamine, Dibutylaminoethanol, Diethylaminoethanol, Diethylaminoethoxyethanol, Diisopropylaminoethanol, Dimethylamino-2P, 77% Mixed, Dimethylamino-2-P, Anhy., Dimethylaminoethanol, Dimethylaminoethoxyethanol, Ethylaminoethanol, Ethylaminoethanol, Mixed, Isopropylaminoethanol, Isopropylaminoethanol, Mixed, Methyl-diethanolamine, Monomethylaminoethanol, Mono-n-Propylaminoethanol, n-Butylaminoethanol, n-Butyl-diethanolamine, n-Butyl-diethanolamine, Photo, t-Butylaminoethanol, t-butyl-diethanolamine, Diethanolamine, Monoethanolamine, Triethanolamine, Triethanolamine 85%/99%, Diisopropanolamine, Monoisopropanolamine, Triisopropanolamine, Aminoethylethanolamine, Aminoethylpiperazine, Diethylenetriamine, Ethylenediamine, Piperazine 65%/Anhy., Piperazine, Tetraethylenepentamine, Triethylenetetramine, 3-Methoxypropylamine, AMP.RTM. Regular/95, Cyclohexylamine, Morpholine, Neutrol TE.RTM, or a combinations thereof.

[0018] The glycol solvent can comprise Diethylene Glycol, Dipropylene Glycol, Ethylene Glycol, Glycerine 96%, 99%, U.S.P., Glycerine, Hexylene Glycol, Neol.RTM. Neopentyglycol, Polyethylene Glycol, Polypropylene Glycol, Propylene Glycol Ind., U.S.P., Tetraethylene Glycol, Triethylene Glycol, Tripropylene Glycol, or a combination thereof.

[0019] The ketone solvent can comprise Acetone, Cyclohexanone, Diacetone, DIBK--Diisobutyl Ketone, Isophorone, MAK--Methyl Amyl Ketone, MEK--Methyl Ethyl Ketone, MIAK--Methyl Isoamyl Ketone, MIBK--Methyl Isobutyl Ketone, MPK--Methyl Propyl Ketone, or a combination thereof.

[0020] The ester solvent can comprise Amyl Acetate, Dibasic Ester, Ethyl Acetate, 2 Ethyl Hexyl Acetate, Ethyl Propionate, Exxate.RTM. Acetate Esters, Isobutyl Acetate, Isobutyl Isobuterate, Isopropyl Acetate, n-Butyl Acetate, n-Butyl Propionate, n-Pentyl Propionate, n-Propyl Acetate, or a combination thereof.

[0021] The alcohol solvent can comprise Amyl Alcohol, Benzyl Alcohol, Cyclohexanol, Ethyl Alcohol-Denatured, 2-Ethyl Hexanol, Exxal 8.RTM. Isooctyl Alcohol, Exxal 10.RTM. Isodecyl Alcohol, Exxal 13.RTM. Tridecyl Alcohol, Furfuryl Alcohol, Isobutyl Alcohol, Isopropyl Alcohol 99% Anhy, Methanol, Methyl Amyl Alcohol (MIBC), n-Butyl Alcohol, n-Propyl Alcohol, Neodol.RTM. Linear Alcohol, Secondary Butyl Alcohol, Tertiary Butyl Alcohol,

Tetrahydrofurfuryl Alcohol, Texanol Ester Alcohol.RTM., UCAR Filmer IBT.RTM, or a combination thereof.

[0022] The halogenated solvent can comprise Methylene Chloride, Monochlorobenzene, Orthodichlorobenzene, Perchloroethylene, Trichloroethylene, Vertrel.RTM. Hydrofluorocarbon, or a combination thereof.

[0023] The terpene solvent can comprise Alpha-Pinene, Wood, Dipentene 122.RTM., D-Limonene, Herco.RTM. Pine Oil, Solvenol.RTM., Steam Distilled Turpentine, Terpeneol.RTM., Yarmor.RTM. 302,302-W Pine Oil, or a combination thereof.

[0024] The aromatic solvent can comprise Aromatic 100, Aromatic 150, Aromatic 200, Aromatic 200ND, Heavy Aromatic Solvent, Panasol.RTM., Toluene, Xylene, or a combination thereof.

[0025] The biodegradable organic solvent can comprise vegetable oil (e.g., renewable resource oil), biodiesel, or a combination thereof. Vegetable oil refers to compounds extracted from plants. For example, the compounds extracted from plants are primarily triglyceride-based, and present as liquid, fatty waxy, or solid state at room temperature. Vegetable oils that are waxy or solid at room temperature are also called vegetable fats. In Addition, vegetable oil contains both saturated and unsaturated carbon-carbon double bonds.

[0026] Unsaturated vegetable oils can be transformed through partial or complete hydrogenation into oils of higher melting point. The hydrogenation process involves sparging the oil at a high temperature and a high pressure with hydrogen in the presence of a catalyst, typically a nickel based compound. As each carbon-carbon double-bond is chemically reduced to a single bond, two hydrogen atoms each form single bonds with the two carbon atoms to increase its degree of saturation. An oil may be hydrogenated to increase resistance to rancidity (oxidation) or to change its physical characteristics. As the degree of saturation increases, the oil's viscosity and melting point increase.

[0027] The vegetable oil can comprise linseed oil, coconut oil, corn oil, cottonseed oil, palm oil, canola oil, palm kernel oil, olive oil, peanut oil, rapeseed oil, safflower oil, sesame oil, soybean oil, sunflower oil, castor oil, tung oil, poppyseed oil, vernonia oil, almond oil, beech nut oil, Brazil nut oil, virgin oil, cashew oil, hazelnut oil, macadamia oil, mongongo nut oil (manketti oil), pecan oil,

pine nut oil, pistachio oil, walnut oil, pumpkin seed oil, pracaxi oil, grape seed oil, rice bran oil, carapa oil, hempseed oil, or a combination thereof.

[0028] Renewable resource oil is derived from sustainable and renewable sources of fatty acids and resins, such as tall oil. Tall oil, also called "liquid rosin" or tallol, is a yellow-black liquid obtained as a by-product of wood pulping process. Tall oil is the third largest chemical by-product in a Kraft mill after lignin and hemicellulose; the yield of crude tall oil from the process is in the range of 30 – 50 kg / ton pulp, and it has been produced commercially since the 1930s. Biodiesel refers to a vegetable oil- or animal fat-based diesel fuel comprising long-chain alkyl (methyl, ethyl, or propyl) esters. Biodiesel is typically made by chemically reacting lipids (e.g., vegetable oil, soybean oil,[1] animal fat (tallow[2][3])) with an alcohol producing fatty acid esters.

[0029] The organic solvent can comprise a flash point of at least 20 degrees Celsius, such as, for example, at least 30 degrees Celsius, at least 40 degrees Celsius, at least 50 degrees Celsius, at least 60 degrees Celsius, at least 70 degrees Celsius, at least 80 degrees Celsius, at least 100 degrees Celsius, at least 150 degrees Celsius, or at least 200 degrees Celsius.

[0030] The wood preservative composition can comprise a concentration of the organic solvent of at least 50 % by weight based on the total weight of the composition, such as, for example, at least 60 % by weight, at least 70 % by weight, at least 80 % by weight, or at least 90 % by weight, all based on the total weight of the composition. The wood preservative composition can comprise a concentration of organic solvent in a range of 50 % by weight to 99 % by weight based on the total weight of the composition, such as, for example, 50 % by weight to 98 % by weight, 60 % by weight to 98 % by weight, 70 % by weight to 98 % by weight, or 80 % by weight to 96 % by weight, all based on the total weight of the composition. The organic solvent can be polar, non-polar, a combination of polar and non-polar solvents.

[0031] The retaining additive comprises a solvent-borne polymeric resin, a wax, or a combination thereof. Without being bound to any particular theory, the retaining additive can bind the DCOI to the wood product, entrap the DCOI within the wood , physically fix the DCOI to the wood product, and/or otherwise inhibit movement of the DCOI in the wood product (e.g., from inside of the wood product to a surface of the wood product). The concentration of the retaining additive in the wood preservative composition can be balanced with the concentration of the DCOI used in the wood

preservative composition according to the present disclosure to achieve a desired retention of the DCOI in a wood product treated with the wood preservative composition according to the present disclosure. For example, a weight ratio of the DCOI to the retaining additive can be in a range of 1:5 to 5:1, such as, for example, 1:4 to 4:1, 1:3 to 3:1, 1:2 to 2:1, 1.5:1 to 1:1.5, or 1.1:1 to 1:1.1. In various examples, a weight ratio of the DCOI to the retaining additive can be 1:1.

[0032] The wood preservation composition according to the present disclosure can comprise a concentration of the retaining additive of at least 0.05 % by weight based on the total weight of the composition, such as, for example, at least 0.2 % by weight, at least 0.5 % by weight, at least 1.0 % by weight, at least 1.2 % by weight, at least 1.5 % by weight, at least 2 % by weight, at least 3 % by weight, or at least 4 % by weight, all based on the total weight of the composition. The wood preservation composition according to the present disclosure can comprise a concentration of the retaining additive of no greater than 20 % by weight based on the total weight of the composition, such as, for example, no greater than 15 % by weight, no greater than 10 % by weight, no greater than 9 % by weight, no greater than 8 % by weight, no greater than 5 % by weight, no greater than 4 % by weight, no greater than 3 % by weight, or no greater than 2.5 % by weight, all based on the total weight of the composition. For example, the wood preservative composition can comprises a concentration of the retaining additive in a range of 0.05 % by weight to 20 % by weight based on the total weight of the composition, such as, for example, 0.2 % by weight to 20 % by weight, 0.5 % by weight to 20 % by weight, 1 % by weight to 15 % by weight, 1 % by weight to 10 % by weight, 1 % by weight to 5 % by weight, 1.5 % by weight to 10 % by weight, 2 % by weight to 5 % by weight, 1.5 % by weight to 3 % by weight, or 1.5 % by weight to 2.5 % by weight, all based on the total weight of the composition. For example, the wood preservative composition according to the present disclosure can comprise 2.5 % by weight of the retaining additive based on the total weight of the composition.

[0033] The solvent borne polymeric resin can comprise an epoxy, an acrylic, an acrylate, a polyurethane, a polyurea resin, a vinyl resin, a cellulose resin, a polyester resin, a polyether resin, a phenolic resin, an alkyd resin (e.g., short oil alkyd, long chain alkyd resin), a hydrocarbon resin, or a combination thereof. For example, the solvent borne polymeric resin can comprise a hydrocarbon resin, an alkyd resin, or a combination thereof. The solvent borne polymeric resin can comprise an alkyd resin (e.g., a long chain alkyd resin, such as, for example, a polymeric resin based on linseed

oil). The solvent borne polymeric resin can comprise a long chain alkyd resin and the organic solvent is non-polar character (e.g., odorless mineral spirits). The long chain alkyd resin can comprise greater than 55% oil length.

[0034] The wax can comprise a paraffin wax, an olefin wax, a petroleum wax, a carnauba wax, a polyethylene wax, a slack wax, a silicone wax, a polypropylene wax, a polytetrafluoroethylene (PTFE) synthetic wax, or a combination thereof.

[0035] The retaining additive can have a solubility in the organic solvent of at least 0.5% by weight, such as, for example, at least 1% by weight, at least 1.5% by weight, or at least 2% by weight.

[0036] Water may be present in the wood preservative composition according to the present disclosure, which can lead to the formation of stable emulsions that can affect the treatment of a wood product. The wood preservative composition according to the present disclosure can be formulated to inhibit emulsion formation and/or can comprise a de-emulsifier. The de-emulsifier can comprise an alkylphenol formaldehyde resin alkoxylate (AFRA), a polyalkylene glycol (PAG), an organic sulfonate, or a combination thereof. For example, the de-emulsifier can comprise a Stepan series de-emulsifiers (e.g., Agent NE-3A, NE-3B, Toximul 8244); Dow Chemicals DM series de-emulsifiers (e.g., DM3, DM5, DM6); Munzing Foamban series de-emulsifiers (e.g., 1550, TK-150, TK-75, WP-35); Evonik Tego Foamex series de-emulsifiers (e.g., 843, 844, 883, Surfynol 420); Demtrol series de-emulsifiers (e.g., 1030, 1040, 1130, 1135E, 2030, 2045, 4026, 6055, 6237); Reziflow series de-emulsifiers (e.g., 2110, 2215, 2130, 2140, 2205, 2210, 2300, 2305, 2600, 2605, 2720, 2740); or a combination thereof.

[0037] The wood preservative composition may not phase separate when stored at ambient temperature (i.e., a temperature in a range of 20 degrees Celsius to 24 degrees Celsius) for at least 60 minutes, such as, for example, at least 120 minutes, at least 240 minutes, 24 hours, 48 hours, or 72 hours.

[0038] The wood preservative composition according to the present disclosure can also optionally comprise a colorant, an ultraviolet (UV) stabilizer, a UV absorber, de-foamer, a water repellent, an additional biocide, a fungicide, a termiticide, a fire retardant, or a combination thereof. The UV stabilizer can comprise copper oxide, a copper salt, iron oxide, iron complexes, transparent iron

oxide, iron salts, nanoparticle iron oxide, titanium dioxide, benzophenone, substituted benzophenones, cinnamic acid, esters of cinnamic acid, amides of cinnamic acid, substituted triazines (e.g., triphenyl triazine, substituted phenyl triazine), or combinations thereof. The UV absorber can comprise benzotriazole, substituted benzotriazole, hindered amine light stabilizers, or combinations thereof. The water repellent can comprise a wax water repellent (e.g., paraffin wax, polyethylene wax, carnauba wax, slack wax), a silicone, or combinations thereof.

[0039] The fire retardant can be one or more compounds selected from the group consisting of inorganic metal oxides, hydroxides, salts and expandable graphite phosphate compounds, nitrogen-containing compounds, dipentaerythritol, pentaerythritol, dextrin and boron-containing compounds.

[0040] The additional biocide can comprise a creosote, a triazole, an imidazole, a pyrazole, a boron compound, a quaternary ammonium, an isothiazolone, a pyrethroid, copper metal, a copper compound (e.g., copper naphthenate), pentachlorophenol, bethoxazin, or a combination thereof.

[0041] Triazole and imidazole can comprise: 1-[[2-(2,4-dichlorophenyl)-1,3-dioxolan-2-yl]methyl]-1H-1,2,4-triazole (azaconazole), 1-[(2RS,4RS:2RS,4SR)-4-bromo-2-(2,4-dichlorophenyl)tetrahydrofurfuryl]-1H-1,2,4-triazole (bromuconazole), (2RS,3RS;2RS,3SR)-2-(4-chlorophenyl)-3-cyclopropyl-1-(1H-1,2,4-triazol-1-yl)butan-2-ol (Cyproconazole), (2RS,3RS)-1-(2,4-dichlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pentan-3-ol (diclobutrazol), cis-trans-3-chloro-4-[4-methyl-2-(1H-1,2,4-triazol-1-ylmethyl)-1,3-dioxolan-2-yl]phenyl 4-chlorophenyl ether (difenoconazole), (E)-(RS)-1-(2,4-dichlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pent-1-en-3-ol (diniconazole), (E)-(R)-1-(2,4-dichlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pent-1-en-3-ol (diniconazole-M), (2RS,3SR)-1-[3-(2-chlorophenyl)-2,3-epoxy-2-(4-fluorophenyl)propyl]-1H-1,2,4-triazole (epoxiconazole), (RS)-1-[2-(2,4-dichlorophenyl)-4-ethyl-1,3-dioxolan-2-ylmethyl]-1H-1,2,4-triazole (etaconazole), (RS)-4-(4-chlorophenyl)-2-phenyl-2-(1H-1,2,4-triazol-1-ylmethyl)butyronitrile (fenbuconazole), 3-(2,4-dichlorophenyl)-6-fluoro-2-(1H-1,2,4-triazol-1-yl)quinazolin-4(3H)-one (fluquinconazole), bis(4-fluorophenyl)(methyl)(1H-1,2,4-triazol-1-ylmethyl)silane (flusilazole), (RS)-2,4'-difluoro- α -(1H-1,2,4-triazol-1-ylmethyl)benzhydryl alcohol (flutriafol), (2RS,5RS;2RS,5SR)-5-(2,4-dichlorophenyl)tetrahydro-5-(1H-1,2,4-triazol-1-ylmethyl)-2-furyl 2,2,2-trifluoroethyl ether (furconazole), (2RS,5RS)-5-(2,4-dichlorophenyl)tetrahydro-5-(1H-1,2,4-triazol-1-ylmethyl)-2-furyl 2,2,2-trifluoroethyl ether (furconazole-cis), (RS)-2-(2,4-

dichlorophenyl)-1-(1H-1,2,4-triazol-1-yl)hexan-2-ol (hexaconazole), 4-chlorobenzyl (EZ)-N-(2,4-dichlorophenyl)-2-(1H-1,2,4-triazol-1-yl)thioacetamide (imibenconazole), (1RS,2SR,5RS;1RS,2SR,5SR)-2-(4-chlorobenzyl)-5-isopropyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol (ipconazole), (1RS,5RS;1RS,5SR)-5-(4-chlorobenzyl)-2,2-dimethyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol (metconazole), (RS)-2-(4-chlorophenyl)-2-(1H-1,2,4-triazol-1-ylmethyl)hexanenitrile (myclobutanil), (RS)-1-(2,4-dichloro- β -propylphenethyl)-1H-1,2,4-triazole (penconazole), cis-trans-1-[2-(2,4-dichlorophenyl)-4-propyl-1,3-dioxolan-2-ylmethyl]-1H-1,2,4-triazole (propiconazole), (RS)-2-[2-(1-chlorocyclopropyl)-3-(2-chlorophenyl)-2-hydroxypropyl]-2,4-dihydro-1,2,4-triazole-3-thione (prothioconazole), 3-(2,4-dichlorophenyl)-2-(1H-1,2,4-triazol-1-yl)-quinazolin-4(3H)-one (quinconazole), (RS)-2-(4-fluorophenyl)-1-(1H-1,2,4-triazol-1-yl)-3-(trimethylsilyl)propan-2-ol (simeconazole), (RS)-1-p-chlorophenyl-4,4-dimethyl-3-(1H-1,2,4-triazol-1-ylmethyl)pentan-3-ol (tebuconazole), propiconazole, (RS)-2-(2,4-dichlorophenyl)-3-(1H-1,2,4-triazol-1-yl)propyl 1,1,2,2-tetrafluoroethyl ether (tetraconazole), (RS)-1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)butan-2-one (triadimefon), (1RS,2RS;1RS,2SR)-1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)butan-2-ol (triadimenol), (RS)-(E)-5-(4-chlorobenzylidene)-2,2-dimethyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol (triticonazole), (E)-(RS)-1-(4-chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pent-1-en-3-ol (uniconazole), (E)-(S)-1-(4-chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pent-1-en-3-ol (uniconazole-P), 2-(2,4-difluorophenyl)-1-(1H-1,2,4-triazole-1-yl)-3-trimethylsilyl-2-propanol, or a combination thereof. Other azole compounds suitable as an additional biocide can comprise amisulbrom, bitertanol, fluotrimazole, triazbutil, climbazole, clotrimazole, imazalil, oxpoconazole, prochloraz, triflumizole, azaconazole, simeconazole, hexaconazole, or a combination thereof.

[0042] The pyrazole can comprise: benzovindiflupyr, bixafen, fenpyrazamine, fluxapyroxad, furametpyr, isopyrazam, oxathiapiprolin, penflufen, penthiopyrad, pydiflumetofen, pyraclostrobin, pyrametostrobin, pyraoxystrobin, rabenzazole, sedaxane, or a combination thereof.

[0043] The boron compound can comprise water-insoluble boron compounds, such as, for example, metal borate compounds (e.g., calcium borate, borate silicate, aluminum silicate borate hydroxide, silicate borate hydroxide fluoride, hydroxide silicate borate, sodium silicate borate, calcium silicate

borate, aluminum borate, boron oxide, magnesium borate, iron borate, copper borate, and zinc borate (borax)).

[0044] The quaternary ammonium can comprise didecyldimethylammonium chloride; didecyldimethylammonium carbonate/bicarbonate; alkyl dimethylbenzylammonium chloride; alkyl dimethylbenzylammonium carbonate/bicarbonate; didodecyldimethylammonium chloride; didodecyldimethylammonium carbonate/bicarbonate; didodecyldimethylammonium propionate; N,N-didecyl-N-methyl-poly(oxyethyl)ammonium propionate, or a combination thereof.

[0045] The isothiazolone can comprise methylisothiazolinone; 5-chloro-2-methyl-4-isothiazoline-3-one, 2-methyl-4-isothiazoline-3-one, 2-n-octyl-4-isothiazoline-3-one, 4,5-dichloro-2-n-octyl-4-isothiazoline-3-one, 2-ethyl-4-isothiazoline-3-one, 4,5-dichloro-2-cyclohexyl-4-isothiazoline-3-one, 5-chloro-2-ethyl-4-isothiazoline-3-one, 2-octyl-3-isothiazolone, 5-chloro-2-t-octyl-4-isothiazoline-3-one, 1,2-benzisothiazoline-3-one, preferably 5-chloro-2-methyl-4-isothiazoline-3-one, 2-methyl-4-isothiazoline-3-one, 2-n-octyl-4-isothiazoline-3-one, 4,5-dichloro-2-n-octyl-4-isothiazoline-3-one, 1,2-benzisothiazoline-3-one, etc., more preferably 5-chloro-2-methyl-4-isothiazoline-3-one, 2-n-octyl-4-isothiazoline-3-one, 4,5-dichloro-2-n-octyl-4-isothiazoline-3-one, 1,2-benzisothiazoline-3-one, chloromethylisothiazolinone, 4,5-Dichloro-2-n-octyl-3(2H)-isothiazolone, 1,2-benzisothiazolin-3-one, or a combination thereof.

[0046] The pyrethroid can comprise: acrinathrin, allethrin, bioallethrin, barthrin, bifenthrin, bioethanomethrin, cyclothrin, cycloprothrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, gamma-cyhalothrin, lambda-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, theta-cypermethrin, zeta-cypermethrin, cyphenothrin, deltamethrin, dimefluthrin, dimethrin, empenethrin, fenfluthrin, fenpirithrin, fenpropathrin, fenvalerate, esfenvalerate, flucythrinate, fluvalinate, tau-fluvalinate, furethrin, imiprothrin, metofluthrin, permethrin, biopermethrin, transpermethrin, phenothrin, prallethrin, profluthrin, pyresmethrin, resmethrin, bioresmethrin, cismethrin, tefluthrin, terallethrin, tetramethrin, tralomethrin, transfluthrin, etofenprox, flufenprox, halfenprox, protrifenbute, silafluofen, or a combination thereof.

[0047] The additional biocide can comprise imidachloprid, fipronil, cyfluthrin, bifenthrin, permethrin, cypermethrin, chlorpyrifos, iodopropynyl butylcarbamate (IPBC), chlorothalonil, 2-

(thiocyanatomethylthio) benzothiazole, alkoxylated diamines, carbendazim, or a combination thereof. The additional biocide can comprise a bactericide, a moldicide, or a combination thereof.

[0048] The wood preservative composition can comprise a flash point suitable for handling and/or a desirable treatment application. For example, the wood preservative composition can comprise a flash point of at least 20 degrees Celsius, such as, for example, at least 30 degrees Celsius, at least 40 degrees Celsius, at least 50 degrees Celsius, at least 60 degrees Celsius, at least 70 degrees Celsius, at least 80 degrees Celsius, at least 100 degrees Celsius, at least 110 degrees Celsius, at least 120 degrees Celsius, at least 130 degrees Celsius, or at least 140 degrees Celsius.

[0049] The present disclosure also provides a method for making the wood preservative composition. The method can comprise dissolving the DCOI and the polymeric resin in the organic solvent, thereby forming the wood preservative composition. In various examples, a de-emulsifier may be added to the organic solvent and/or other component (e.g., a colorant, an ultraviolet stabilizer, a de-foamer, a water repellent, an additional biocide, a fungicide, a termiticide, a fire retardant or a combination thereof). In various examples, the wood preservative composition according to the present disclosure is made by dissolving the DCOI in the organic solvent, thereby forming an intermediate mixture followed by mixing the intermediate mixture with the polymeric resin and the de-emulsifier.

[0050] The wood preservative composition according to the present disclosure can be formulated as a concentrated composition (e.g., greater than 5 % by weight DCOI based on the total weight of the composition) or a diluted composition (e.g., ready to treat formulation, 0.5 % by weight to 5 % by weight DCOI based on the total weight of the composition). For example, if the wood preservative composition according to the present disclosure is formulated as a concentration composition, the concentration composition can be diluted with another organic solvent, which may be the same or different than the organic solvent used to formulate the concentrated composition, prior to treating a wood substrate with the wood preservative composition. In certain examples, the concentrated formulation may be formed by mixing the DCOI with a retaining additive (with or without the presence of an organic solvent) at a temperature above the melting point of DCOI. The resulting concentrate can be in a liquid form or a solid form. In addition, the resulting concentrate can be further diluted in an organic solvent to make the final wood preservative treating composition. In

certain examples, the concentrated formulation may be used to treat a wood substrate to form a wood product.

[0051] The present disclosure also provides a method of treating a wood substrate, thereby forming a wood product. The method comprises contacting a wood substrate with the wood preservative composition according to the present disclosure for a period of time suitable to inhibit fungal decay of the wood substrate. The method of treating the wood substrate can inhibit biological deterioration (e.g., fungal decay) and insect attack of the wood product (e.g., termite attack). The contacting can be performed until the wood product retains at least 0.05 pounds of DCOI per cubic foot (pcf) of the wood product, such as, for example, at least 0.10 pounds of DCOI pcf of the wood product or at least 0.15 pounds of DCOI pcf of the wood product.

[0052] Contacting the wood substrate can comprise dipping, soaking, spraying, brushing, a vacuum process, a pressure process, or a microwave process. For example, the contacting can comprise a modified full-cell process, an empty-cell process, or a combination thereof. In various examples, contacting comprises the empty-cell process and the empty-cell process comprises a Rueping process and a Lowry process. For example, in the empty-cell process, prior to the introduction of wood preservative composition according to the present disclosure, the wood substrate is subjected to atmospheric air pressure (Lowry) or to higher air pressures than atmospheric (Rueping) of the necessary intensity and duration. Various example contacting processes that can be used with the present disclosure are defined in the American Wood Protection Association (AWPA) Book of Standards T1-21: Processing and Treatment Standard, which is hereby incorporated by reference.

[0053] The present disclosure also provides a wood product produced by treating a wood substrate with the wood preservative composition according to the present disclosure. The wood product can comprise timber, plywood, laminated veneer lumber (LVL), cross laminated timber (CTL), parallel strand lumber (PSL), structural glued laminated timber, particle board, dimensional lumber, or a combination thereof. In various examples, the wood product comprises a deck, a rail, a fence, a utility pole, a pile, a railway tie, a railroad bridge, cladding, siding, or a combination thereof. For example, the wood product can comprise a utility pole.

[0054] The wood product can comprise various species of wood. For example, the wood product can comprise southern pine, Douglas fir, Jack pine, red pine, Lodgepole pine, radiata pine, Alaska yellow cedar, Hem-fir, Nordic pine, Scotts pine, white spruce, Spruce-Pine-Fir, redwood, white oak, red oak, maple, black and red gum, Norway spruce, Sitka spruce, western red cedar, western larch, ponderosa pine, or a combination thereof.

[0055] By treating the wood product with the wood preservative composition according to the present disclosure, the wood product can leach less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive (i.e., the same components except the retaining additive is replaced with addition organic solvent). For example, the wood product can leach at least 5% less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive, such as, for example, at least 10% less, at least 15% less, at least 20% less, at least 25% less, at least 30% less, at least 40% less, at least 50% less, at least 60% less, at least 75% less, at least 80% less, or at least 90% less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive.

[0056] By treating the wood product with the wood preservative composition according to the present disclosure, less DCOI can be dislodged from a surface of the wood product after 72 hours as measured by wiping with a polyester wipe 9 times across the surface of the wood product than a comparative wood product treated with a comparative composition without the retaining additive. For example, the wood product can dislodge at least 5% less DCOI from a surface of the wood product after 72 hours as measured by wiping with a polyester wipe 9 times across the surface of the wood product than a comparative wood product treated with a comparative composition without the retaining additive, such as, for example, at least 10% less, at least 15% less, at least 20% less, at least 25% less, at least 30% less, at least 40% less, at least 50% less, at least 60% less, at least 75% less, at least 80% less, or at least 90% less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive.

[0057] EXAMPLES

[0058] The present disclosure will be more fully understood by reference to the following examples, which provide illustrative non-limiting aspects of the invention. It is understood that the invention described in this specification is not necessarily limited to the examples described in this section.

[0059] Retaining additive and Organic Solvent Compatibility Testing

[0060] For testing the compatibility of the organic solvent and the retaining additive at a 1 % by weight concentration, 0.1 gram of the retaining additive and 9.9 grams of the organic solvent can be added to a 20 mL clear glass vial and mixed together. Thereafter, the vial is stored at a selected temperature (i.e., ambient temperature or 40 degrees Fahrenheit in a refrigerator). The vial is monitored for up to 7 days for phase separation and precipitation which may indicate incompatibility between the organic solvent and the retaining additive.

[0061] By way of example, various retaining additives were tested for compatibility with #2 diesel at 1 % by weight according to the method described above and the results are shown in Table 1 below. A retaining additive was determine to be compatible if there was no observable phase separation or precipitation after 7 days of storage at ambient temperature and 40 degrees Fahrenheit.

[0062] Table 1. Retaining additive Compatibility with #2 Diesel

Trade Name of Retaining additive	General Composition	Supplier	Compatibility (wt. 1%)
Chempol 801-2164	Alkyd Resin	Arkema	Yes
Chempol 801-6005	Alkyd Resin	Arkema	Yes
Chempol 801-7961	Alkyd Resin	Arkema	Yes
Paraffin Wax	Wax	Aldrich	Yes
Slack Wax	Wax	Aldrich	Yes
Piccotac™ 8095	Hydrocarbon Resin	Eastman	Yes
Piccotac™ 1095	Hydrocarbon Resin	Eastman	Yes
CAB 381-0.1	Cellulose Ester Resin	Eastman	No
CAB 551-0.2	Cellulose Ester Resin	Eastman	No
Desmodur XP2675	Polyisocyanate Resin	Covestro	No
Desmodur N3900	Polyisocyanate Resin	Covestro	No
Desmodur N3400	Polyisocyanate Resin	Covestro	No

Pearlstick 5714	Polyurethane Resin	Lubrizol	No
Pearlstick 5703	Polyurethane Resin	Lubrizol	No
Pearlstick 5701	Polyurethane Resin	Lubrizol	No
Setalux 27-1550	Acrylic Resin	Allnex	No
Setalux 1190 SS-61	Acrylic Resin	Allnex	No
Duroxyn EF900/60X	Epoxy Resin	Allnex	No
Duroxyn EF935/60X	Epoxy Resin	Allnex	No
Sancure™ 1511	Polyester Resin	Lubrizol	No

[0063] During the testing it was observed that Chempol 801 alkyd resin, Paraffin wax, Slack wax and Piccotac hydrocarbon resin were compatible with #2 diesel at 1 % by weight. Without being bound by any particular theory, it is believed that the compatibility of the retaining additive with #2 diesel is based on the solubility of the respective retaining additive in #2 diesel. Therefore, various combinations of retaining additives and organic solvents can be selected for use with the wood preservative composition according to the present disclosure by utilizing the compatibility test described herein.

[0064] Organic Solvent Solvency with DCOI and Retaining additive Testing

[0065] For testing the solvency (i.e., ability to dissolve) of the organic solvent for DCOI and the retaining additive, 4.7 gram of DCOI and 5.0 g of retaining additive were dissolved in 10.3 gram of organic solvent to make a 23.5% of DCOI and 25.0% resin solution in a clear 20 ml glass vial. Thereafter, the vial is stored at a selected temperature (i.e., ambient temperature, 40 degrees Fahrenheit, or 120 degree Fahrenheit or whenever a crosslinking may occur). The vial is monitored for up to 7 days for phase separation, precipitation, and turbidity, which may indicate incompatibility between the organic solvent and the retaining additive and/or DCOI. The as prepared solution is maintained at room temperature and 40 degrees Fahrenheit for up to 7 days or whenever a phase separation, precipitation or solution turbidity event happens to disqualify the solution.

[0066] The results of the solvency test of various organic solvents with DCOI and Chempol 801-2164 are shown in Table 2 below. The solvents were tested at 40 degrees Fahrenheit and rated low solvency, medium solvency, or high solvency based on the amount, if any, of separation, precipitation, and turbidity observed in each solution.

[0067] Table 2. Solvency of DCOI/retaining additive in Organic Solvents

Solvent	CAS#	Flash Point (°C)	DCOI/Resin Solvency
Exxsol D 40	64742-47-8	44	Medium
Exxsol D 60	64742-47-8	64	Medium
Exxsol D 80	64742-47-8	83	Medium
Exxsol D 95	64742-47-8	96	Medium
Exxsol D 110	64742-47-8	115	Medium
Exxsol D 130	64742-46-7	137	Low
Varsol 1	8052-41-3	45	Medium
Varsol 18	8052-41-3	44	Medium
Varsol 60	64742-82-1	65	Medium
Varsol 80	64742-81-0	80	Medium
Varsol 110	64742-81-0	116	Medium
Varsol 120	64742-81-0	120	Medium
Varsol 140	64742-80-9	66	Low
Varsol 140 naphtha	64742-47-8	65	Medium
Aromatic 100	64742-95-6	46	High
Aromatic 150	64742-94-5	65	High
Aromatic 150 ND	64742-94-5	64	High
Aromatic 200	64742-94-5	107	High
Aromatic 200 ND	64742-94-5	111	High
Diesel # 2	68476-34-6	58-76	High
Benzyl Alcohol	100-51-6	93	High

[0068] Based on the results above, Aromatic 100, Aromatic 150, Aromatic 150 ND, Aromatic 200, Aromatic 200ND, diesel fuel # 2, and benzyl alcohol were determined to be good candidates for further performance testing. It is believed other solvents are also suitable and that the solvents that did not perform well in this test may be suitable with other retaining additives and/or additional components to improve the solubility of the retaining additive.

[0069] Preparation of a Concentrated Wood Preservative Composition

[0070] To prepare a concentrated wood preservative composition, 200 grams of wood preservative concentrate is prepared by adding 103 grams of organic solvent, 47 grams of DCOI, and 50 gram of retaining additive under agitation to a 200 mL beaker until a homogenous solution is formed. The beaker can be placed in a 40°C water bath to speed up the dissolving process.

[0071] Preparation of a Diluted Wood Preservative Composition

[0072] 5 kilogram of a diluted wood preservative composition is prepared by adding 4500 grams of an additional organic solvent, #2 diesel, and 500 grams of the concentrated wood preservative composition under agitation to a 5-liter beaker until a homogenous solution is formed.

[0073] De-emulsifier Evaluation

[0074] To evaluate the effectiveness of a de-emulsifier, de-emulsifier was added to 20 ml of diluted wood preservative composition in a glass vial to achieve a concentration of 1000 ppm and mixed thoroughly. Thereafter, 5 ml of water is added into the glass vial and a line at the water/oil interface is marked with a marker. Then the vial is mix for 10 seconds using a vortex mixer. After mixing, the vial is placed on a countertop and observed over time to determine how long it takes the water to completely separate from the wood preservative composition based on the previously marked line.

[0075] Various de-emulsifiers were tested with a wood preservative composition comprising 2.3 % by weight DCOI, 2.5 % by weight of Chempol 801-2164, and Aromatic 200 ND according to the procedures described above. The results of the de-emulsifier testing is shown in Table 3 below:

[0076] Table 3. Evaluation of De-emulsifiers at 1000 ppm in the Wood Preservative Composition

De-emulsifier	Observations
Foam Ban HV-830G	Starts getting water separation at 2.5 minutes. Water is very hazy. No change at 5 minutes.
Foam Ban HV-810G	Starts getting water separation that is clear after 30s. Most of the water has separated out after 1 minute.
Foam Ban 1839	Starts getting water separation at 45s. Rapid separation but water is hazy. Water layer clears up over 2 days.
Foam Ban 820-N	Starts getting some separation at 30s. About 90% of water has separated out after 1 minute. Water is clear.
Tego Foamex 843	No Separation
Tego Foamex 883	No Separation
Surfynol 420	Starts getting water separation after 1.5 minutes. Close to 70% of water has separated out by 5 minutes. 95% of water has separated out by 6.5 minutes.
Emulsogen EL 360A	Starts getting water separation after 2 minutes. Close to 50% of water has separated out by 5 minutes. 90% of water has separated out by 6.5 minutes.
Foam Ban WP-35	Has a good layer of separation by 15s. 90% has separated by 1 minute

Foam Ban MS-550	Does not mix with the Diesel phase. Most of the water has separated out by 30 seconds but is hazy. Water is still hazy after 5 minutes. Water layer is still hazy after sitting over 2 days.
-----------------	--

[0077] As shown in Table 3, many de-emulsifiers are likely suitable for further performance testing in a wood preservative composition. It is believed other emulsifiers are also suitable for use with diesel #2 and that the performance of the de-emulsifier can change based on the organic solvent used.

[0078] Various diluted wood preservative compositions were prepared from concentrated wood preservative compositions as shown in Table 4 below. The organic solvent used in Table 4 is a mixture of Aromatic 200 and diesel #2.

[0079] Table 4- Various diluted wood preservative compositions

Sample	DCOI (% by weight)	Retaining additive Name	Retaining additive (% by weight)	Aromatic 200 (% by weight)	De-emulsifier Name	Demulsifier (% by weight)	Diesel #2 (% by weight)
#1	2.35	Chempol 801-2164	2.50	5.13	Surfynol 420	0.1	89.92
#2	2.35	Chempol 801-2164	2.50	5.13	Foam Ban WP35	0.1	89.92
#3	2.35	Chempol 801-2164	2.50	5.13	Foam Ban 820-N	0.1	89.92
#4	2.35	Chempol 801-7961	2.50	5.13	Foam Ban WP35	0.1	89.92
#5	2.35	Chempol 801-7961	2.50	5.13	Foam Ban 820-N	0.1	89.92
#6	2.35	Piccotac™ 8095	2.50	5.13	Foam Ban WP35	0.1	89.92
#7	2.35	Piccotac™ 8095	2.50	5.13	Foam Ban 820-N	0.1	89.92
#8	2.35	Piccotac™ 1095	2.50	5.13	Foam Ban WP35	0.1	89.92
#9	2.35	Piccotac™ 1095	2.50	5.13	Foam Ban 820-N	0.1	89.92
#10	2.35	Slack Wax	2.50	0	Foam Ban WP35	0.1	95.05

#11	2.35	Slack Wax	2.50	5.13	Foam Ban 820-N	0.1	89.92
#12 (Comparative)	2.35	Not used	0	Not used	Not used	0	97.65

[0080] Evaluation of leaching of DCOI

[0081] To evaluate the leaching of DCOI from a wood substrate treated with samples #1-#12, SYP blocks were milled to cubes having dimensions of 0.75" X 0.75" X 0.75" with a ring count of 6-10 rings per inch were prepared. A set of cubes (minimum of 24) were used for test each sample #1-#12 and weighed individually before treating. To treat each set of cubes, the cubes were placed in a plastic container and weighed down with weights to prevent the cubes from floating. Then the container was placed in desiccator and subjected to a vacuum of -26"Hg for 20 minutes. The container was fill with one of the solution of one of samples #1-#12 under vacuum and the vacuum pump was turned off once all the cubes in the container were below the liquid level. The cubes were allowed to soak at atmospheric pressure for 30 minutes. After the 30 minutes had elapsed, the solution of the respective sample #1-#12 was removed and each cube in the container was weighed. This procedure was repeated until a set of cubes had been prepared for each of samples #1-#12.

[0082] The sets of cubes were then placed in oven at 120 degrees Fahrenheit and dried for 4 weeks. Once a week, four preselected cubes from each set of cubes were weighed. After the four weeks had passed, the sets of cubes were remove from the oven and allowed to sit at ambient temperature for 1 day.

[0083] From each set of cubes, 24 cubes with the most uniformed retention of the respective sample #1-#12 were selected for DCOI leach testing. Then, for each set, the 24 cubes were randomly divided into 4 groups of 6. Three of the groups were water impregnated while the fourth group was used to determine the unleached retention of DCOI.

[0084] For water impregnation of each group, the group was placed in a 16oz glass jar and weighed down to prevent floating. 300ml of deionized water was then added to the jars. The jars were placed into a cylinder without lids and subjected to a -26"Hg vacuum for 20 minutes. The vacuum was removed and the jars were sealed for the leaching testing.

[0085] For the leaching testing, each jar was placed on a shake table. The shake table was turned on and set to 100 RPMs. 300 mL aliquots of the water solution from each jar were taken at selected intervals and replaced with an additional 300ml of deionized water. Each aliquot taken was analyzed for DCOI content. The jars were observed for a minimum of 14 days. A summary of the results of the leaching testing are provided in Table 5 below:

[0086] Table 5 - DCOI Leaching Results

DCOI in water (ppm)							
Sample	6h	1d	2d	4d	7d	14d	In total
#2	0.066	0.026	0.018	0.012	0.008	0	0.130
#10	0.089	0.033	0.031	0.016	0.009	0	0.178
#12	0.159	0.039	0.032	0.013	0.008	0.002	0.253

[0087] As shown in Table 5 above, Samples #2 and #10 had an improved leach rate of DCOI into the deionized water than comparative sample #12 indicating the respective retaining additive inhibited the release of DCOI into the deionized water.

[0088] Wood treatment

[0089] Samples #1-#12 were used to treat wood substrates. The wood substrates were 3" x 10" prepared from select 1 SYP 5/4" thick deck board with no defects. To treat each wood substrate to create a wood product, a cylinder was filled with 5 kg with one of samples #1-12#. Thereafter, the wood substrate was added and subjected to a treatment cycle of 15 minutes at -26"Hg initial vacuum, 30 minutes at 100psi pressure, and 15 minutes at -26"Hg final vacuum.

[0090] Evaluation of Surface Dislodgeability of DCOI

[0091] After treatment, boards were placed in a 120°F oven and dried for 41 days, and after removal were left at ambient temperature for 11 additional days.

[0092] After conditioning, the boards were cut into 3 pieces with dimensions of 3" x 35/16" x 1". Polyester wipes were cut to a dimension of 3" X 4" and attached to a 27/8" x 27/8" x 1" steel block using tape. A piece of parafilm was placed between the wipe and the block and was changed every wipe to prevent cross contamination. Each sample board was placed in a holder and wiped 9 times

across a surface of the sample board using only gravity for down pressure. Thereafter, the wipe was placed in a large centrifuge tube and 30g of Methanol was added and analyzed for DCOI content.

[0093] An initial wipe was performed on each board. Then each sample board was placed in a QUV chamber and wiped at day 3 and then every 7 days after that. In the QUV chamber, each board was subjected to a repeating cycle of 2.5hrs of UV exposure followed by a 0.5 hr water spray. This cycle repeated until the testing was completed.

[0094] Table 6. Dislodgeability of DCOI

	DCOI dislodged from the surface (ppm)					
Sample	0d	3d	9d	23d	33d	In total
#2	0.131	0.042	0.033	0.01	0.009	0.225
#12	0.198	0.079	0.012	0.004	0.021	0.314

[0095] As observed from Table 6 above, a wood substrate treated with sample #2 showed less DCOI surface dislodging after 33 days compared to DCOI alone.

[0096] It is believed that other wood preservative compositions according to the present disclosure can also retain more DCOI in the wood product than comparative wood preservative compositions.

[0097] In this specification, unless otherwise indicated, all numerical parameters are to be understood as being prefaced and modified in all instances by the term “about”, in which the numerical parameters possess the inherent variability characteristic of the underlying measurement techniques used to determine the numerical value of the parameter. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claims, each numerical parameter described herein should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

[0098] Also, any numerical range recited herein includes all sub-ranges subsumed within the recited range. For example, a range of “1 to 10” includes all sub-ranges between (and including) the recited minimum value of 1 and the recited maximum value of 10, that is, having a minimum value equal to or greater than 1 and a maximum value equal to or less than 10. Any maximum numerical limitation recited in this specification is intended to include all lower numerical limitations subsumed therein,

and any minimum numerical limitation recited in this specification is intended to include all higher numerical limitations subsumed therein. Accordingly, Applicant reserves the right to amend this specification, including the claims, to expressly recite any sub-range subsumed within the ranges expressly recited.

[0099] The grammatical articles “a,” “an,” and “the,” as used herein, are intended to include “at least one” or “one or more,” unless otherwise indicated, even if “at least one” or “one or more” is expressly used in certain instances. Thus, the articles are used herein to refer to one or more than one (*i.e.*, to “at least one”) of the grammatical objects of the article. Further, the use of a singular noun includes the plural, and the use of a plural noun includes the singular, unless the context of the usage requires otherwise.

[0100] Any patent, publication, or other disclosure material identified herein is incorporated by reference into this specification in its entirety unless otherwise indicated, but only to the extent that the incorporated material does not conflict with existing descriptions, definitions, statements, or other disclosure material expressly set forth in this specification. As such, and to the extent necessary, the express disclosure as set forth in this specification supersedes any conflicting material incorporated by reference. Any material, or portion thereof, that is said to be incorporated by reference into this specification, but which conflicts with existing definitions, statements, or other disclosure material set forth herein, is only incorporated to the extent that no conflict arises between that incorporated material and the existing disclosure material. Applicants reserve the right to amend this specification to expressly recite any subject matter, or portion thereof, incorporated by reference herein.

[0101] One skilled in the art will recognize that the herein described components (*e.g.*, operations), devices, objects, and the discussion accompanying them are used as examples for the sake of conceptual clarity and that various configuration modifications are contemplated. Consequently, as used herein, the specific exemplars set forth and the accompanying discussion are intended to be representative of their more general classes. In general, use of any specific exemplar is intended to be representative of its class, and the non-inclusion of specific components (*e.g.*, operations), devices, and objects should not be taken limiting.

[0102] With respect to the appended claims, those skilled in the art will appreciate that recited operations therein may generally be performed in any order. Also, although various operational flows

are presented in a sequence(s), it should be understood that the various operations may be performed in other orders than those which are illustrated, or may be performed concurrently. Examples of such alternate orderings may include overlapping, interleaved, interrupted, reordered, incremental, preparatory, supplemental, simultaneous, reverse, or other variant orderings, unless context dictates otherwise. Furthermore, terms like “responsive to,” “related to,” or other past-tense adjectives are generally not intended to exclude such variants, unless context dictates otherwise.

[0103] One skilled in the art will recognize that the herein-described components, devices, operations/actions, and objects, and the discussion accompanying them, are used as examples for the sake of conceptual clarity and that various configuration modifications are contemplated. Consequently, as used herein, the specific examples/embodiments set forth and the accompanying discussion are intended to be representative of their more general classes. In general, use of any specific exemplar is intended to be representative of its class, and the non-inclusion of specific components, devices, operations/actions, and objects should not be taken limiting. While the present disclosure provides descriptions of various specific aspects for the purpose of illustrating various aspects of the present disclosure and/or its potential applications, it is understood that variations and modifications will occur to those skilled in the art. Accordingly, the invention or inventions described herein should be understood to be at least as broad as they are claimed and not as more narrowly defined by particular illustrative aspects provided herein.

CLAIMS

WHAT IS CLAIMED IS:

1. A wood preservative composition comprising:
an organic solvent;
at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition; and
a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof,
wherein a weight ratio of the DCOI to the retaining additive is in a range of 1:5 to 5:1, and
wherein the retaining additive has a solubility in the organic solvent of at least 0.5 % by weight.
2. The wood preservative composition of claim 1, wherein the composition comprises 0.5 % by weight to 10.0 % by weight of the DCOI based on the total weight of the composition.
3. The wood preservative composition of claim 1, wherein the composition comprises 1.0 % by weight to 5.0 % by weight of the DCOI based on the total weight of the composition.
4. The wood preservative composition of claim 1, wherein the composition comprises 1.5 % by weight to 3.0 % by weight of the DCOI based on the total weight of the composition.
5. The wood preservative composition of any of claims 1-4, wherein the weight ratio of the DCOI to the retaining additive is in a range of 1:5 to 5:1.
6. The wood preservative composition of any of claims 1-4, wherein the weight ratio of the DCOI to the retaining additive is in a range of 1:2 to 2:1.
7. The wood preservative composition of any of claims 1-4, wherein the weight ratio of the DCOI to the retaining additive is in a range of 1:1.5 to 1.5:1.

8. The wood preservative composition of any of claims 1-7, wherein the composition comprises 0.05 % by weight to 20 % by weight of the retaining additive based on the total weight of the composition.
9. The wood preservative composition of any of claims 1-7, wherein the composition comprises 1 % by weight to 10 % by weight of the retaining additive based on the total weight of the composition.
10. The wood preservative composition of any of claims 1-9, wherein the retaining additive comprises the solvent-borne polymeric resin and the solvent-borne polymeric resin comprises an epoxy, an acrylic, an acrylate, a polyurethane, a polyurea, a vinyl resin, a cellulose resin, a polyester resin, a polyether resin, a phenolic resin, an alkyd resin, a hydrocarbon resin, or a combination thereof.
11. The wood preservative composition of claim 10, wherein the solvent-borne polymeric resin comprises a hydrocarbon resin, an alkyd resin, or a combination thereof.
12. The wood preservative composition of any of claims 10-11, wherein the solvent-borne polymeric resin comprises an alkyd resin.
13. The wood preservative composition of claim 12, wherein the solvent-borne polymeric resin comprises a long chain alkyd resin.
14. The wood preservative composition of any of claims 12-13, wherein the solvent-borne polymeric resin is based on linseed oil.
15. The wood preservative composition of any of claims 1-14, wherein the retaining additive comprises the wax and the wax comprises a paraffin wax, an olefin wax, a petroleum wax, a carnauba wax, a polyethylene wax, a slack wax, a silicone wax, a polypropylene wax, a polytetrafluoroethylene (PTFE) synthetic wax, or a combination thereof.

16. The wood preservative composition of any of claims 1-15, wherein the organic solvent comprises a hydrocarbon solvent, an amine solvent, a glycol solvent, a ketone solvent, an ester solvent, an alcohol solvent, a halogenated solvent, an aliphatic solvent, an aromatic solvent, a terpene solvent, a biodegradable organic solvent, or combinations thereof.
17. The wood preservative composition of claim 16, wherein the organic solvent comprises a hydrocarbon solvent.
18. The wood preservative composition of claim 17, wherein the hydrocarbon solvent comprises diesel.
19. The wood preservative composition of claim 18, wherein the diesel comprises a flash point of at least 50 degrees Celsius.
20. The wood preservative composition of any of claims 1-19, wherein the organic solvent comprises a flash point of at least 20 degrees Celsius.
21. The wood preservative composition of any of claims 1-20, wherein the wood preservative composition comprises a flash point of at least 20 degrees Celsius.
22. The wood preservative composition of any of claims 1-21, wherein the wood preservative composition comprises a flash point of at least 50 degrees Celsius.
23. The wood preservative composition of any of claims 1-22, further comprising a de-emulsifier.
24. The wood preservative of claim 23, wherein the de-emulsifier comprises an alkylphenol formaldehyde resin alkoxylate (AFRA), a polyalkylene glycol (PAG), an organic sulfonate, or a combination thereof.

25. The wood preservative composition of any of claims 23-24, wherein the wood preservative composition does not phase separate when stored at ambient temperature for at least 60 minutes.
26. The wood preservative composition of any of claims 1-25, wherein the wood preservative composition further comprises a colorant, an ultraviolet stabilizer, a de-foamer, a water repellent, an additional biocide, a fungicide, a termiticide, a fire retardant, or a combination thereof.
27. The wood preservative composition of any of claims 1-26, wherein the retaining additive has a solubility in the organic solvent of at least 1%.
28. A method of treating a wood substrate, the method comprising contacting the wood substrate with the wood preservative composition of any of claims 1-27 for a period of time suitable to inhibit fungal decay of the wood substrate.
29. The method of claim 28, wherein the contacting comprises a modified full-cell process, an empty-cell process, or a combination thereof.
30. The method of claim 29, wherein the contacting comprises the empty-cell process and the empty-cell process comprises a Rueping process and a Lowry process.
31. A wood product produced by treating a wood substrate with the wood preservative composition of any of claims 1-27.
32. A wood product comprising the wood preservative composition of any of claims 1-27.
33. The wood product of any of claims 31-32, wherein the wood product leaches less DCOI into deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive.
34. The wood product of any of claims 31-33, wherein less DCOI is dislogeable from a surface of the wood product after 72 hours as measured by wiping with a polyester wipe 9 times across the

surface of the wood product than a comparative surface of a comparative wood product treated with a comparative composition without the retaining additive.

35. The wood product of claims 31-34, wherein the wood product retains at least 0.05 pounds of DCOI per cubic foot of the wood product.

36. The wood product of any of claims 31-35, wherein the wood product comprises timber, plywood, laminated veneer lumber (LVL), cross laminated timber (CTL), parallel strand lumber (PSL), structural glued laminated timber, particle board, dimensional lumber, or a combination thereof.

37. The wood product of any of claims 31-36, wherein the wood product comprises a deck, a rail, a fence, a utility pole, a pile, a railway tie, a railroad bridge, cladding, siding, or a combination thereof.

38. The wood product of any of claims 31-37, wherein the wood product comprises a utility pole.

39. The wood product of any of claims 31-38, wherein the wood product comprises southern pine, Douglas fir, Jack pine, red pine, Lodgepole pine, radiata pine, Alaska yellow cedar, Hem-fir, Nordic pine, Scotts pine, white spruce, Spruce-Pine-Fir, redwood, white oak, red oak, maple, black and red gum, Norway spruce, Sitka spruce, , western red cedar, western larch, ponderosa pine, or a combination thereof.

40. A wood preservative composition for application to a wood product, comprising:
an organic solvent;
at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition; and
a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof, wherein the retaining additive is present in the wood preservative composition in an amount sufficient such that when applied to the wood product, the wood product leaches less DCOI into

deionized water after 24 hours than a comparative wood product treated with a comparative composition without the retaining additive.

41. A wood preservative composition for application to a wood product, comprising:
- an organic solvent;
 - at least 0.5 % by weight of 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on the total weight of the composition; and
 - a retaining additive comprising a polymeric resin, a wax, or a combination thereof, wherein the retaining additive is present in the wood preservative composition in an amount sufficient such that when applied to the wood product, less DCOI is dislogeable from a surface of the wood product after 72 hours as measured by wiping with a polyester wipe 9 times across the surface of the wood product than a comparative surface of a comparative wood product treated with a comparative composition without the retaining additive.

ABSTRACT

A wood preservative composition comprising 4,5-dichloro-2-octylisothiazol-3(2H)-one, a method of treating a wood substrate therewith, and a wood product produced therefrom are provided. The wood preservative composition comprises an organic solvent, at least 0.5 % by weight of DCOI based on the total weight of the composition, and a retaining additive comprising a solvent-borne polymeric resin, a wax, or a combination thereof. A weight ratio of the DCOI to the retaining additive in the composition is in a range of 1:5 to 5:1. The polymeric resin has a solubility in the organic solvent of at least 0.5%.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM		
First Named Inventor/Applicant Name:		Min Kuang		
Filer:		William E. Kuss/Jessica Brandenburg		
Attorney Docket Number:		210189P		
Filed as Large Entity				
Filing Fees for Provisional				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
PROVISIONAL APPLICATION FILING	1005	1	300	300
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 (\$)				300

Electronic Acknowledgement Receipt	
EFS ID:	43437430
Application Number:	63229817
International Application Number:	
Confirmation Number:	9678
Title of Invention:	A WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM
First Named Inventor/Applicant Name:	Min Kuang
Customer Number:	26285
Filer:	William E. Kuss/Jessica Brandenburg
Filer Authorized By:	William E. Kuss
Attorney Docket Number:	210189P
Receipt Date:	05-AUG-2021
Filing Date:	
Time Stamp:	16:22:20
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 300
RAM confirmation Number	E202185G22542681
Deposit Account	021818
Authorized User	Jessica Brandenburg
<p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>37 CFR 1.16 (National application filing, search, and examination fees)</p> <p>37 CFR 1.17 (Patent application and reexamination processing fees)</p>	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	Provisional_Coversheet_8-5-21.pdf	1416538	no	3
			6ecac0918c6ffac6af35b18b1589239035a73b46c		
Warnings:					
This is not a USPTO supplied Provisional Cover Sheet SB16 form.					
Information:					
2	Application Data Sheet	ADS_8-5-21.pdf	1822446	no	8
			a196981cc5ddf3d64d6b3a940851b30c687e0ae		
Warnings:					
Information:					
3		Application_8-5-21.pdf	282466	yes	33
			5536f3e96b88125fcb64d7417983ce65d58de273		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	26	
	Claims		27	32	
	Abstract		33	33	
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	38136	no	2
			a8439a83fd0f85a228f286ae57cd97a89d843f		
Warnings:					
Information:					
Total Files Size (in bytes):			3559586		

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.