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505 Tenth Street, NW, Atlanta, GA 30332-0415 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HERTEL, Rolf, Michael** [DE/DE]; Wilhelm-Hertz-Strasse 7, 80805 Munich (DE). **BOMMARIUS, Andreas, Sebastian** [DE/US]; 1105 Vernon Springs Court, NW, Atlanta, GA 30327 (US). **REALFF, Matthew, James** [GB/US]; 532 St. Charles Avenue, Atlanta, GA 30308-1812 (US). **KANG, Yuzhi** [CN/US]; 1995 Defoor Avenue, NW, Apt. B, Atlanta, GA 30318 (US).(74) Agents: **SCHNEIDER, Ryan, A.** et al.; Bank of America Plaza, 600 Peachtree Street, NE, Suite 5200, Atlanta, GA 30308-2216 (US).

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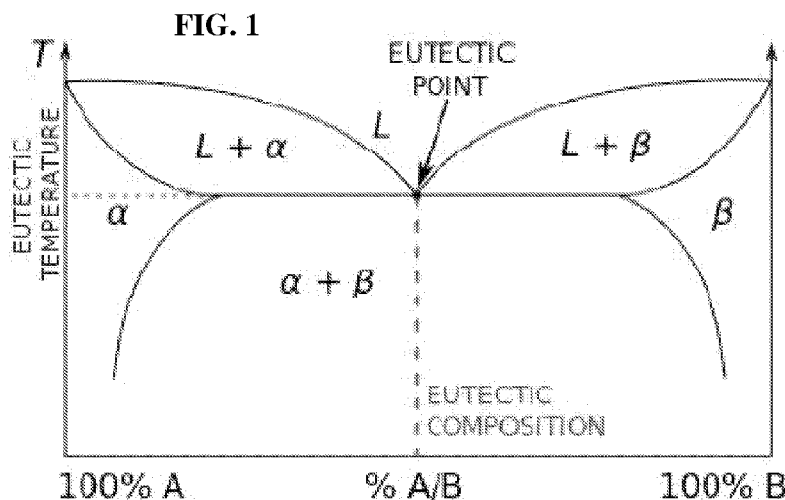
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(54) Title: DEEP EUTECTIC SOLVENT SYSTEMS AND METHODS



(57) Abstract: A Deep Eutectic Solvent (DES) system that comprises betaine monohydrate as one component. Additional component can be urea or acids, such as malonic acid or dtric add. The melting point of the mixture can be considerably lower 5 than the melting point of either component. The use of betaine monohydrate is advantageous because of its low cost, among other reasons. The DES can be used to dissolve components, such as cellulose, starch, lignin, synthetic polymers, and others, that are not soluble in other media. After treatment of AVICEL (cellulose) with a DES comprising betaine monohydrate and urea, there can be a decrease of crystallinity of at least about 10-15 %.

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C11D 7/00 (2012.01) USPC - 510/405 According to International Patent Classification (IPC) or to both national classification and IPC																				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8)- C11D 7/00 (2012.01); USPC- 510/405 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Patents and NPL (classification, keyword; search terms below) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWest (US Pat, PgPub, EPO, JPO), GoogleScholar (PL, NPL), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL); search terms: eutectic, betaine, monohydrate, urea, malonic, citric, hydrogen, bond, donor, quaternary, ammonium, phosphonium																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X — Y</td> <td>WO 2010/128212 A1 (NURMI et al.) 11 November 2010 (11.10.2010), pg 4, ln 15-19; pg 7, ln 34-38</td> <td>9 ----- 10-17, 27, 30, 33</td> </tr> <tr> <td>Y</td> <td>US 2009/0247432 A1 (MILLER) 01 October 2009 (01.10.2009), para [0010]-[0016], [0022], [0040], [0041], [0048], [0058], [0060]</td> <td>1-8, 10-36</td> </tr> <tr> <td>Y</td> <td>CHIAPPE "The Possibility to Obtain a new Generation of Ionic Liquids Starting from Natural Compounds." in "Green Chemical Reactions," ed. Tundo, et al., NATO Science for Peace and Security Series C: Environmental Security, 2008 [Retrieved on 2012-07-10], pp. 13-35, Retrieved from the Internet: <URL: http://www.springerlink.com/content/j76637757426178v/>, see entire document, especially pg 20, para 2 to pg 21, para 3</td> <td>1-8, 18-26, 28, 29, 31, 32, 34-36</td> </tr> <tr> <td>Y</td> <td>US 2010/0311701 A1 (ALMARSSON et al.) 09 December 2010 (09.12.2010), para [0110], [0158], [0160], [0222], [0224], [0227]</td> <td>29-36</td> </tr> <tr> <td>Y</td> <td>US 2004/0097755 A1 (ABBOT et al.) 20 May 2004 (20.05.2004) para [0035]-[0039]</td> <td>1-8, 10-36</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X — Y	WO 2010/128212 A1 (NURMI et al.) 11 November 2010 (11.10.2010), pg 4, ln 15-19; pg 7, ln 34-38	9 ----- 10-17, 27, 30, 33	Y	US 2009/0247432 A1 (MILLER) 01 October 2009 (01.10.2009), para [0010]-[0016], [0022], [0040], [0041], [0048], [0058], [0060]	1-8, 10-36	Y	CHIAPPE "The Possibility to Obtain a new Generation of Ionic Liquids Starting from Natural Compounds." in "Green Chemical Reactions," ed. Tundo, et al., NATO Science for Peace and Security Series C: Environmental Security, 2008 [Retrieved on 2012-07-10], pp. 13-35, Retrieved from the Internet: <URL: http://www.springerlink.com/content/j76637757426178v/ >, see entire document, especially pg 20, para 2 to pg 21, para 3	1-8, 18-26, 28, 29, 31, 32, 34-36	Y	US 2010/0311701 A1 (ALMARSSON et al.) 09 December 2010 (09.12.2010), para [0110], [0158], [0160], [0222], [0224], [0227]	29-36	Y	US 2004/0097755 A1 (ABBOT et al.) 20 May 2004 (20.05.2004) para [0035]-[0039]	1-8, 10-36
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