

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
11 August 2011 (11.08.2011)

PCT

(10) International Publication Number
W^o 2011/097219 A3

(51) International Patent Classification:

C07C 29/149 (2006.01) C07C 29/88 (2006.01)
C07C 29/76 (2006.01) C07C 31/08 (2006.01)
C07C 29/80 (2006.01) C07C 29/09 (2006.01)

(21) International Application Number:

PCT/US2011/023325

(22) International Filing Date:

1 February 2011 (01.02.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/300,815 2 February 2010 (02.02.2010) US
61/332,728 7 May 2010 (07.05.2010) US
12/889,813 24 September 2010 (24.09.2010) US

(71) Applicant (for all designated States except US):
CELANESE INTERNATIONAL CORPORATION
[US/US]; 1601 West LBJ Freeway, Dallas, Texas 75234
(US).

(72) Inventors; and

(75) Inventors/ Applicants (for US only): **JOHNSTON, Victor, J.** [US/US]; 3234 Pleasant Cove Court, Houston, Texas 77059 (US). **CHAPMAN, Josefina, T.** [US/US]; 15427 Rocky Oak Court, Houston, Texas 77059 (US). **JEVTIC, Radmila** [RS/US]; 7022 Red Coral Drive, Pasadena, Texas 77505 (US). **WEINER, Heiko** [DE/US]; 4827 Baywood Drive, Pasadena, Texas 77059 (US). **PAN, Tianshu** [US/US]; 4115 Crimson Oak Court, Houston, Texas 77059 (US). **WARNER, R., Jay** [US/US]; 3507 East Pine Brook Way, Houston, Texas 77062 (US). **GRUSENDORF, Gerald** [US/US]; 14003 Savannah Landing Lane, Rosharon, Texas 77583 (US). **BOWER, Nathan** [US/US]; 4448 Center Street, Hous-

ton, Texas 77007 (US). **SARAGER, Lincoln** [US/US]; 16110 La Cabana Drive, Houston, Texas 77062 (US).

(74) Agents: **FREDLAKE, Keith, DS** et al; 7918 Jones Branch, Suite 500, McLean, Virginia 22102 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

3 November 2011

(54) Title: PROCESS FOR PURIFYING A CRUDE ETHANOL PRODUCT

(57) Abstract: Recovery of ethanol from a crude ethanol product obtained from the hydrogenation of acetic acid. Separation and purification processes of the crude ethanol products are employed to allow recovery of ethanol and remove acetal impurities.



WO 2011/097219 A3

INTERNATIONAL SEARCH REPORT

International application No PCT/US2011/023325

A. CLASSIFICATION OF SUBJECT MATTER				
INV. C07C29/149	C07C29/76	C07C29/80		
C07C29/09	C07C29/88	C07C31/08		
ADD.				
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) C07C				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal , WPI Data				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 4 48Q 115 A (CELANESE CORPORATION) 30 October 1984 (1984-10-30) the whole document -----	1-25		
X	US 4 517 391 A (BASF AKTI ENGESELLSCHAFT) 14 May 1985 (1985-05-14) the whole document -----	1-25		
X	US 4 777 303 A (BP CHEMICALS LIMITED) 11 October 1988 (1988-10-11) the whole document -----	1-25		
X	W0 2009/063176 A1 (BP P.L.C.) 22 May 2009 (2009-05-22) pages 18-21 and example on page 23 -----	1-25		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; border: none; vertical-align: top;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family			
Date of the actual completion of the international search	Date of mailing of the international search report			
2 September 2011	15/09/2011			
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Breimaier, Waltraud			

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/023325

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4480115	A	30-10-1984	NONE
US 4517391	A	14-05-1985	DE 3221077 AI 08-12-1983 EP 0100406 AI 15-02-1984
US 4777303	A	11-10-1988	AU 592980 B2 01-02-1990 AU 5601286 A 16-10-1986 AU 592981 B2 01-02-1990 AU 5601386 A 16-10-1986 CA 1264727 AI 23-01-1990 CA 1262719 AI 07-11-1989 CN 86102420 A 08-10-1986 CN 86102452 A 03-12-1986 DE 3677809 DI 11-04-1991 DE 3689050 DI 28-10-1993 DE 3689050 T2 13-01-1994 EP 0198681 A2 22-10-1986 EP 0198682 A2 22-10-1986 JP 61275234 A 05-12-1986 JP 2107096 C 06-11-1996 JP 8025931 B 13-03-1996 JP 61275237 A 05-12-1986 NZ 215765 A 29-11-1988 NZ 215766 A 29-11-1988 US 4804791 A 14-02-1989 US 4826795 A 02-05-1989 US 4990655 A 05-02-1991 US 5061671 A 29-10-1991
W0 2009063176	AI	22-05-2009	CA 2705723 AI 22-05-2009 CN 101910099 A 08-12-2010 EA 201000788 AI 30-12-2010 EP 2215041 AI 11-08-2010 US 2011046421 AI 24-02-2011