(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 May 2013 (30.05.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/078205 A3

(51) **International Patent Classification**:
B01J 37/02 (2006.01) ***B01J 23/89*** (2006.01)
B01J 23/62 (2006.01) ***C07C 29/149*** (2006.01)
B01J 23/63 (2006.01) ***C07C 31/08*** (2006.01)
B01J 23/656 (2006.01)

(21) **International Application Number**:
PCT/US2012/066067

(22) **International Filing Date**:
20 November 2012 (20.11.2012)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
13/303,494 23 November 2011 (23.11.2011) US

(71) **Applicant**: **CELANESE INTERNATIONAL CORPORATION** [US/US]; 222 W. Las Colinas Blvd. Suite 900N, Irving, Texas 75039 (US).

(72) **Inventors**: **WEINER, Heiko**; 4827 Baywood Drive, Pasadena, Texas 77505 (US). **ALMEIDA, Ana Rita**; Westerstraat 85-II, NL-1015LW Amsterdam (NL). **ORMSBY, Graham**; Meester Jan Gerritzslaan 11a, NL-2024KG Haarlem (NL).

(74) **Agents**: **KENNEDY, Nicoletta** et al.; 7918 Jones Branch Drive, 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, BN, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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**:
7 November 2013

WO 2013/078205 A3

(54) **Title**: CATALYST PREPARATIONS FOR HIGH CONVERSION CATALYSTS FOR PRODUCING ETHANOL

(57) **Abstract**: A process for producing a catalyst, the process comprising the steps of: impregnating a first metal from a first metal precursor on a support to form a first impregnated support; impregnating a second metal from a second metal precursor on the first impregnated support to form a second impregnated support; calcining the second impregnated support to form the catalyst, wherein the catalyst has a total metal loading of at least 2 wt.% based on the total weight of the catalyst. A method for hydrogenating alkanoic acids in the presence of the catalyst is also disclosed.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/066067

A. CLASSIFICATION OF SUBJECT MATTER
INV. B01J37/02 B01J23/62 B01J23/63 B01J23/656 B01J23/89
C07C29/149 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)
B01J 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 practicable, 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	DE 102 52 282 A1 (BASF AG [DE]) 27 May 2004 (2004-05-27) examples 2, 5; table 1	1,2
X	WO 2004/043890 A2 (BASF AG [DE]; SCHUBERT MARKUS [DE]; HUBER-DIRR SYLVIA [DE]; HESSE MICH) 27 May 2004 (2004-05-27) claims 1,8; example 1	1-4,6, 12-15
X	EP 0 285 420 A1 (BRITISH PETROLEUM CO PLC [GB]; BP CHEM INT LTD [GB]) 5 October 1988 (1988-10-05) examples 2,12-15	1-4,6, 12-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent 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
22 April 2013	10/09/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Mattheis, Chris

5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/066067

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-4, 6, 12-15(all partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 6, 12-15(all partially)

   Group IA, process claims for producing a catalyst comprising rhenium, impregnation in 2 steps

   ---

2. claims: 1-4, 6, 12-15(all partially)

   Group IB, process claims for producing a catalyst comprising tin, impregnation in 2 steps

   ---

3. claims: 1-4, 6, 12-15(all partially)

   Group IC, process claims for producing a catalyst comprising iron, impregnation in 2 steps

   ---

4. claims: 1-4, 6, 12-15(all partially)

   Group ID, process claims for producing a catalyst comprising copper, impregnation in 2 steps

   ---

5. claims: 1-4, 6, 12-15(all partially)

   Group IE, process claims for producing a catalyst comprising lanthanum or cerium, impregnation in 2 steps

   ---

6. claims: 5(completely); 1(partially)

   group II, process claims for producing a catalyst, impregnation in 3 steps

   ---

7. claims: 7-11(completely); 1(partially)

   group III, process claims for producing a catalyst, wherein the support is modified

   ---

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/066067

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10252282 A1	27-05-2004	NONE	
WO 2004043890 A2	27-05-2004	AT 455745 T	15-02-2010
		AU 2003293663 A1	03-06-2004
		CN 1711229 A	21-12-2005
		DE 10252280 A1	27-05-2004
		EP 1562882 A2	17-08-2005
		JP 2006505399 A	16-02-2006
		KR 20050086487 A	30-08-2005
		MY 134409 A	31-12-2007
		US 2006030743 A1	09-02-2006
		WO 2004043890 A2	27-05-2004
EP 0285420 A1	05-10-1988	AT 128381 T	15-10-1995
		AU 602208 B2	04-10-1990
		AU 1497888 A	02-11-1988
		CN 1030072 A	04-01-1989
		CN 1059296 A	11-03-1992
		DE 3854529 D1	02-11-1995
		DE 3854529 T2	28-03-1996
		DE 3862601 D1	06-06-1991
		EP 0285420 A1	05-10-1988
		EP 0417867 A1	20-03-1991
		EP 0662343 A1	12-07-1995
		JP 2749090 B2	13-05-1998
		JP H01503459 A	22-11-1989
		NZ 224073 A	28-08-1990
		US 4985572 A	15-01-1991
		WO 8807515 A1	06-10-1988