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kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,  
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KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,  
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(54) Title: TREATING OF CATALYST SUPPORT

(57) Abstract: A method for the preparation of a modified catalyst support comprising: (a) treating a catalyst support material with an aqueous solution or dispersion comprising one or more zirconium metal sources, chromium metal sources, manganese metal sources and aluminium metal sources, and one or more polar organic compounds; and (b) drying the treated support, and (c) optionally calcining the treated support. Also provided are catalyst support materials obtainable by the methods, and catalysts prepared from such supports.



## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2013/052103

## A. CLASSIFICATION OF SUBJECT MATTER

INV. B01J37/18 B01J37/02 B01J21/04 B01J21/06 B01J21/12  
B01J23/26 B01J23/34 B01J23/75 B01J35/00 B01J35/10  
C10G2/00

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 C10G

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	US 5 759 947 A (ZHOU HONGXING [CN]) 2 June 1998 (1998-06-02) examples	1,2,4-7, 9,11-26
X	US 6 040 265 A (NUNAN JOHN G [US]) 21 March 2000 (2000-03-21)  example 4 column 4, line 5	1,2, 4-10, 15-26
X	EP 1 374 978 A1 (FORD GLOBAL TECH INC [US]) FORD GLOBAL TECH LLC [US] 2 January 2004 (2004-01-02) paragraphs [0030], [0032]	1-9, 15-26
X	US 2010/175588 A1 (SCHORR RICHARD J [US]) ET AL) 15 July 2010 (2010-07-15) example 1	1-26
	-/-	



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

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"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

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Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2013/052103

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>AGNIESZKA MICHALAK ET AL: "Physico-Chemical Properties of Cobaltâ Ruthenium (10% Coâ 0.5% Ru) Catalysts Supported on Binary Oxides 8.5%ZrO2/Support (SiO2, Al2O3, TiO2) for Fischer-Tropsch Synthesis", TOPICS IN CATALYSIS, KLUWER ACADEMIC PUBLISHERS-PLENUM PUBLISHERS, NE, vol. 52, no. 8, 14 April 2009 (2009-04-14), pages 1044-1050, XP019689692, ISSN: 1572-9028 paragraph 2.1</p> <p>-----</p>	26,36
X	<p>YI ZHANG ET AL: "A New Preparation Method of Bimodal Catalyst Support and Its Application in Fischer-Tropsch Synthesis", TOPICS IN CATALYSIS, KLUWER ACADEMIC PUBLISHERS-PLENUM PUBLISHERS, NE, vol. 26, no. 1-4, 1 December 2003 (2003-12-01), pages 129-137, XP019292007, ISSN: 1572-9028 "Experimental", first paragraph</p> <p>-----</p>	26,36
X	<p>LIU Y ET AL: "Fischer-Tropsch synthesis in slurry-phase reactors over Mn- and Zr-modified Co/SiO2 catalysts", FUEL PROCESSING TECHNOLOGY, ELSEVIER BV, NL, vol. 90, no. 7-8, 1 July 2009 (2009-07-01), pages 901-908, XP026152554, ISSN: 0378-3820, DOI: 10.1016/J.FUPROC.2009.04.004 [retrieved on 2009-05-02] paragraph 2.1</p> <p>-----</p>	26,36

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2013/052103

## 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.:

1-26, 36

### 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: 1-26, 36

A method for the preparation of a modified catalyst support, comprising the step of treating a catalyst support with a solution or dispersion comprising a metal source and one or more polar organic compounds, wherein the metal source comprises one or more of zirconium, chromium, manganese or aluminium metal source, and the step of drying. A modified catalyst support obtainable by said method and its use in the manufacture of a Fischer-Tropsch catalyst.

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2. claims: 27-33, 39

A method for preparing a catalyst precursor, in which the modified catalyst support of invention 1 is used, the catalyst precursor obtainable by said method and its use to form a Fischer-Tropsch catalyst.

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3. claims: 34, 37, 38, 40, 41

A catalyst obtainable by activation of the precursor of invention 2, the use of the catalyst to catalyse a Fischer-Tropsch reaction.

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4. claim: 35

A microchannel reactor comprising a catalyst of invention 3.

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5. claims: 42-44

First method of conducting a Fischer-Tropsch reaction in a microchannel reaction using the catalyst of invention 3.

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6. claims: 45-48

Second method of conducting a Fischer-Tropsch reaction in a microchannel reaction using the catalyst of invention 3.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/052103

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