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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SUPPRESSION OF METHANATION ACTIVITY OF PLATINUM GROUP METAL WATER-GAS SHIFT CATALYSTS

(57) Abstract: Provided is a method and apparatus for producing hydrogen from an input gas stream containing carbon monoxide and steam that includes contacting the input gas stream with a catalyst. The catalyst contains an inorganic oxide support; a platinum group metal dispersed on the inorganic oxide support; and a methane suppressing dispersed on the inorganic oxide support. The methane suppressing component is selected from the group consisting of oxides of tin, oxides of gallium and combinations thereof. Also provided are preferred catalyst preparations.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/18303

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C01B3/16 B01J23/62 B01J23/63

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 7 C01B B01J

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, PAJ, WPI Data, INSPEC, COMPENDEX, API Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KIRSZENSZTEJN PIOTR ET AL: "Dispersity of Al ₂ O ₃ -SnO ₂ supported platinum from hydrogen pulse chemisorption" REACT KINET CATAL LETT; REACTION KINETICS AND CATALYSIS LETTERS JUNE 1994 ELSEVIER SCIENCE B.V., AMSTERDAM, NETH, vol. 52, no. 2, June 1994 (1994-06), pages 467-474, XP002259695	1-4,7,18-20
A	-----	21
A	EP 1 046 612 A (MATSUSHITA ELECTRIC IND CO LTD) 25 October 2000 (2000-10-25) claims; examples	1,15,18,21
A	-----	1,15,18
	WO 02/26618 A (ENGELHARD CORP) 4 April 2002 (2002-04-04) the whole document	

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Further documents are listed in the continuation of box C.



Patent family members are listed in 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 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.

"G" document member of the same patent family

Date of the actual completion of the international search

30 October 2003

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29. 07. 2004

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/18303

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"ACS 215th National Meeting Book of Abstract Part 1" 1998, ACS, XP002259541 page 266 -----	15,21
A	GB 2 012 607 A (BRITISH PETROLEUM CO) 1 August 1979 (1979-08-01) example 5 -----	1,15,18
A	US 5 298 154 A (VON BALLMOOS ROLAND ET AL) 29 March 1994 (1994-03-29) example 1 -----	1,15,18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/18303

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.
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.:

1-20

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ 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: 1-20

Process for producing hydrogen from carbon monoxide and steam using as catalyst and inorganic oxide support, a platinum group metal on the support and an oxide of gallium or tin to suppress methanation. The subject further includes an apparatus for generating hydrogen incorporating the water gas shift process.

2. claims: 21-26

A method of preparing a catalyst having an inorganic support, a platinum group metal dispersed on the inorganic support and oxides of tin dispersed on the inorganic oxide support.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

● T/US 03/18303

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