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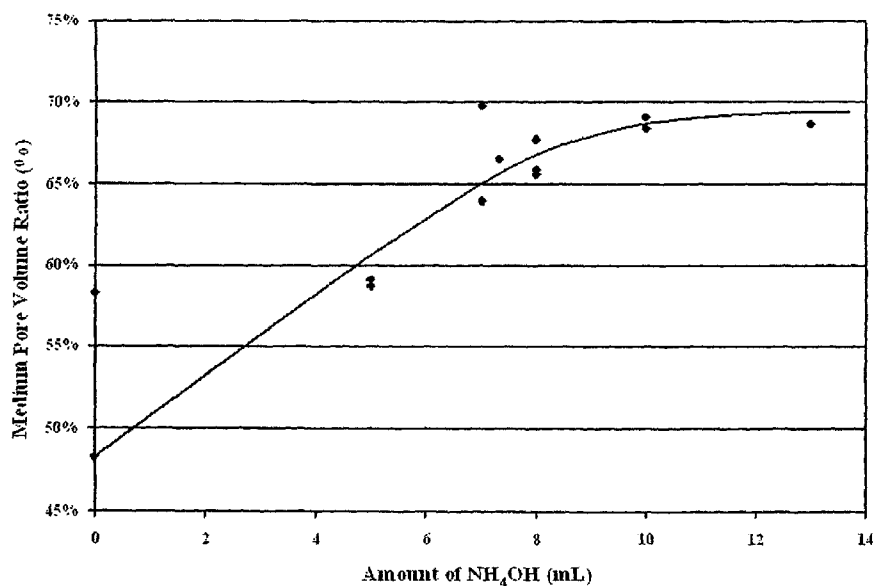
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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: CATALYST FOR METHACROLEIN OXIDATION AND METHOD FOR MAKING AND USING SAME



(57) Abstract: A catalyst for oxidation of unsaturated and/or saturated aldehyde to unsaturated acids is disclosed where the catalyst including at least molybdenum (Mo), phosphorus (P), vanadium (V), bismuth (Bi), and a first component selected from the group consisting of potassium (K), rubidium (Rb), cesium (Cs), thallium (Tl), or mixtures or combinations thereof, where the catalyst has at least 57% medium pores and a nitric acid to molybdenum mole ratio of at least 0.5:1 or at least 6.0:1 moles of HNO₃ per mole of Mo₁₂. Methods for making and using such catalysts are also disclosed.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

(88) **Date of publication of the international search report:**
27 December 2007

Published:

— *with international search report*

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 06/28819

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01J 27/192 (2007.01); C07C 51/16, 51/23 (2007.01)

USPC - 562/535; 502/212

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)

USPC:562/535; 502/212

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)

Electronic Databases Searched: USPTO WEST (PGPUB, EPAB, JPAB, USPT), Google, Thomson dialog.

Search Terms Used: synthesis or preparation, suppo\$, heteropolyacid, catalyst, butaraldehyde, bound adj heteropolyacid, supported adj heteropolyacid, phosphorous and molybdenum and cesium and vanadium

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,198,579 A (Honda et al.) 30 March 1993 (30.03.1993) entire document especially col 2, ln 26-41; col 1, ln 08-14; col 1, ln 55 to col 2, ln 05; col 5, ln 32-36	1-13
Y	US 6,387,841 B1 (Devlin et al.) 14 May 2002 (14.05.2002) col 5, ln 32-41	1-13

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

* 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

22 August 2007 (22.08.2007)

Date of mailing of the international search report

02 OCT 2007

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 06/28819

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:
Group I: claims 1-13 are directed to a catalyst comprising Mo and P adapted to gas-phase oxidize aldehydes to unsaturated acids, where the catalyst has a pore size distribution comprising at least 55% medium pores.

Group II: claims 14-20 and 34-59 are directed to a catalyst for converting aldehydes to unsaturated acids comprising a composition of a specified formula.

Group III: claims 21-33 and 60-80 are directed to a method for preparing a catalyst for converting aldehydes to unsaturated acids comprising the steps of forming a pre-catalyst comprising Mo, P and an ammonium-containing compound in specified ratios, drying, and calcining to form the catalyst.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features.

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 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.: 1-13

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.