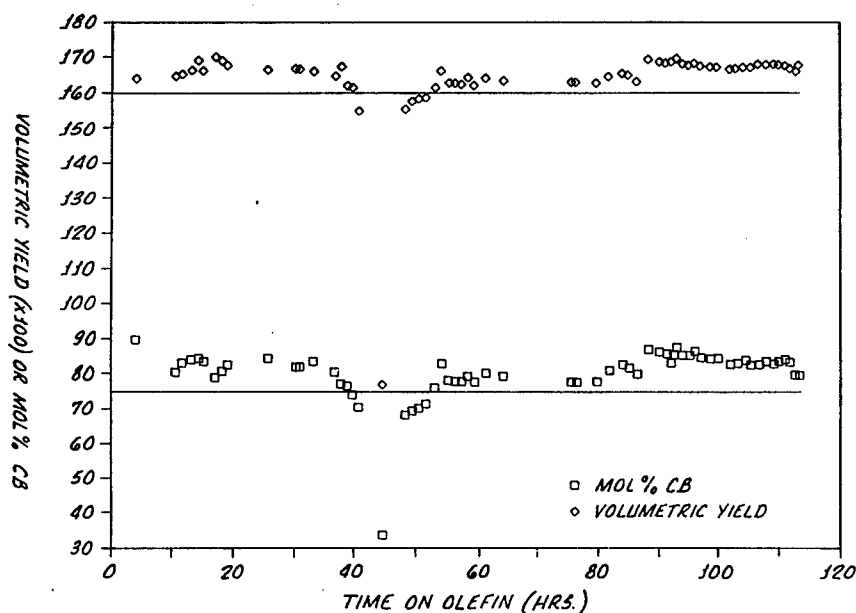




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| (51) International Patent Classification ⁵ : C07C 2/58, B01J 31/18 | A3 | (11) International Publication Number: WO 94/10106 (43) International Publication Date: 11 May 1994 (11.05.94) |
| (21) International Application Number: PCT/US93/10463 (22) International Filing Date: 29 October 1993 (29.10.93) (30) Priority data: 07/968,998 30 October 1992 (30.10.92) US (71) Applicant: CATALYTICA, INC. [US/US]; 430 Ferguson Drive, Mountain View, CA 94043 (US). (72) Inventors: KING, David, L. ; 713 Rustic Lane, Mountain View, CA 94040 (US). COOPER, Michael, D. ; 1349 Yosemite Avenue, San Jose, CA 94306 (US). SANDERSON, William, A. ; 230 Floresta Way, Menlo Park, CA 94025 (US). | | (74) Agent: BARAN, Robert, J.; 29131 Ridgeview Drive, Laguna Niguel, CA 92677 (US). (81) Designated States: CA, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 23 June 1994 (23.06.94) |

(54) Title: ACID CATALYST AND USE THEREOF IN ALKYLATION OF OLEFINS WITH TERTIARY ALKANES

**(57) Abstract**

The present invention provides an acid catalyst complex comprising an organosulfonic acid having at least one covalent carbon-fluorine bond or one covalent carbon-phosphorus bond provided by a phosphono radical which has been contacted with a Lewis Acid to produce a catalyst complex containing said Lewis Acid. The present invention also provides a process for the conversion of a reactant into a reaction product in the presence of said catalyst complex. In particular, the catalyst complex is useful for providing a high octane alkylate stream by converting a mixture comprising isoparaffins and olefins into said alkylate in the presence of said catalyst complex.

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INTERNATIONAL SEARCH REPORT

In ternational application No.
PCT/US93/10463

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :C07C 2/58; B01J 31/18
US CL :502/162, 208; 585/726, 727, 730

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)

U.S. : 502/162, 208; 585/726, 727, 730

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-------------------------------|
| Y | US, A, 2,843,642 (Kelly) 15 July 1958, whole document | 1-39, 49-50, 53, 55-56, 73-74 |
| Y | US, A, 3,873,634 (Hoffman) 25 March 1975, all pages | 1-39, 49-50, 53, 55-56, 73-74 |
| Y | US, A, 4,044,069 (Bernard et al.) 23 August 1977, all pages | 1-39, 49-50, 53, 55-56, 73-74 |
| X | US, A, 4,232,146 (Di Giacomo et al.) 04 November 1980, all pages, particularly column 17, entry No. 20 | 1-39, 49-50, 53, 55-56, 73-74 |

Further documents are listed in the continuation of Box C. See patent family annex.

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| "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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|---|---|
| Date of the actual completion of the international search 10 April 1994 | Date of mailing of the international search report APR 25 1994 Authorized officer <i>[Signature]</i> ASOK PAL |
| Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 | Telephone No. (703) 308-3809 |
| Facsimile No. NOT APPLICABLE | |

INTERNATIONAL SEARCH REPORT

International application No.:

PCT/US93/10463

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international 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:

Please See Extra 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.:
1-39, 49-50, 53, 55-56, and 73-74

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

Group I. Claims 1-39, 49-50, 53, 55-56 and 73-74, drawn to the catalyst and its use in olefin isomerization.

Group II. Claims 1-39, 49-50, 53, 57 and 90, drawn to the process of olefin oligomerization.

Group III. Claims 1-39, 49-50, 53, 55 and 58, drawn to the conversion of olefin to ether.

Group IV. Claims 1-39, 49-50, 53, 55, 59 and 70-71, drawn to the reaction of olefin and carboxylic acid to form an ester.

Group V. Claims 1-39, 49-50, 53, 55, 60 and 72, drawn to the alkylation of aromatic hydrocarbons.

Group VI. Claims 1-39, 49-50, 53, 55 and 61, drawn to the epoxidation of olefins.

Group VII. Claims 1-39, 49-50, 62 and 63, drawn to the dehydration of alcohol to form olefins.

Group VIII. Claims 1-39, 49-50, 62 and 64, drawn to the process of esterification of alcohols.

Group IX. Claims 1-39, 49-50, 62 and 65, drawn to the process of alkylation of aromatics with alcohols.

Group X. Claims 1-39, 49-50 and 66-67 drawn to the alkylation of aromatic or olefinic hydrocarbons with anhydrides.

Group XI. Claims 1-39, 49-50 and 68, drawn to the

process of condensing aldehydes and ketones.

Group XII. Claims 1-39, 49-50, 69 and 75, drawn to the process of conversion of peroxides to acetones and phenols.

Group XIII. Claims 1-39, 49-50 and 76-77, drawn to the

process of conversion of epoxides to glycols. Group XIV. Claims 1-39, 49-50, 78 and 86, drawn to process of hydrolysis of esters.

Group XV. Claims 1-39, 49-50 and 79-80, drawn to the

process of nitration of aromatic compounds.

Group XVI. Claims 1-39, 49-50 and 81, drawn to alkane isomerization.

Group XVII. Claims 1-39, 49-50, 62 and 82-83, drawn to the process of etherification of alcohols.

Group XVIII. Claims 1-39, 49-50, 69 and 84-85, drawn to the process of preparation of percarboxylic acids.

Group XIX. Claims 1-39, 49-50 and 87-88, drawn to the

process of conversion of aldehyde/ketone in the presence of aromatic compounds into phenols.

Group XX. Claims 1-39, 49-50, 87 and 89, drawn to the

process of preparation of aniline.

Group XXI. Claims 40-48, 51-52 and 54, drawn to a metal modified catalyst complex.