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10 December 2009

(54) Title: PROCESS FOR THE PREPARATION OF 2,3,3,3-TETRAFLUOROPROPENE

(57) Abstract: The invention provides a process for the preparation of 2,3,3,3-tetrafluoropropene (1234yf) comprising (a) contacting 1,1,1-trifluoro-2,3-difluoropropane (243db) with hydrogen fluoride (HF) in the presence of a zinc/chromia catalyst to produce a compound having the formula CF_3CHFCH_2X , wherein X is Cl or F, and (b) dehydrohalogenating the compound of formula CF_3CHFCH_2X to produce 1234yf.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. C07C17/20 C07C17/25 C07C19/08 C07C21/18 C07C17/04
 C07C19/10

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)
 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 practical, search terms used)
 EPO-Internal, CHEM ABS Data, BEILSTEIN Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 2008/075017 A (INEOS FLUOR HOLDINGS LTD [GB]; SHARRATT ANDREW PAUL [GB]; LOW ROBERT E) 26 June 2008 (2008-06-26) Page 14, scheme B; route B	1-55,68, 69
A	US 2007/112230 A1 (MUKHOPADHYAY SUDIP [US] ET AL) 17 May 2007 (2007-05-17) examples 1-16,22,26,27	1-55,68, 69
X	paragraphs [0028] - [0032]; example 19	56
A	paragraphs [0028] - [0032]; example 19	57
A	WO 2005/037743 A (DU PONT [US]; RAO VELLIYUR NOTT MALLIKARJUNA [US]; SIEVERT ALLEN CAPRO) 28 April 2005 (2005-04-28) claim 1	1-55,68, 69
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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 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. *&* document member of the same patent family
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Date of the actual completion of the international search 12 October 2009	Date of mailing of the international search report 22/10/2009
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2260 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Cooper, Simon
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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2009/000950

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 93/04025 A (ALLIED SIGNAL INC [US]) 4 March 1993 (1993-03-04) page 4, line 22	1-55, 68, 69
X	DE 21 28 341 A1 (MONTEDISON SPA [IT]) 16 December 1971 (1971-12-16) claim 7	56
X	US 2007/004585 A1 (AMOS TAMMY G [US] ET AL AMOS TAMMY GEORGETTE [US] ET AL) 4 January 2007 (2007-01-04) paragraphs [0033] - [0036]; claim 8	58-69
X	DE 11 40 928 B (DOW CHEMICAL CO) 13 December 1962 (1962-12-13) the whole document	58-69
P, X	WO 2008/054782 A (DU PONT [US]; RAO MALLIKARJUNA V N [US]; SIEVERT ALLEN C [US]) 8 May 2008 (2008-05-08) page 10, lines 18-21; claims 1,2	57

INTERNATIONAL SEARCH REPORT

International application No.
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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 allsearchable 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.:

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: 1-55,68 (partly),69 (partly)

Processes for preparing 1234yf featuring the Zn/chromia catalysed preparation of CF₃CHFCH₂X from CF₃CHACH₂B and HF.

2. claims: 56,68 (partly),69 (partly)

Preparation of CF₃CHFCH₂X from CF₃CH=CH₂ and AB.

3. claims: 57,68 (partly),69 (partly)

Direct conversion of 1243zf to 1234yf.

4. claims: 58-67,68 (partly),69 (partly)

Preparation of 1243zf from CX₃CH₂CH₂X or CX₃CH=CH₂.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2009/000950

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
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