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(54) Title: METHOD FOR PRODUCTION OF ALUMINUM CHLORIDE DERIVATIVES

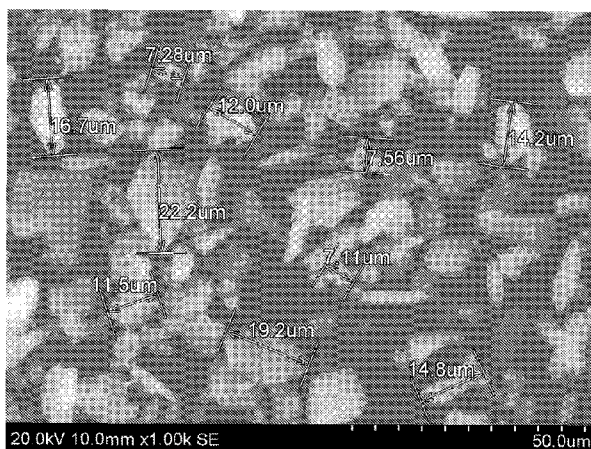


Figure 6

(57) Abstract: Aluminum chlorohydrate products comprise particles of aluminum chlorohydrate in fractured crystal form, the particles having a basicity in the range of 0% to about 85.6 %, and a surface area to weight ratio of about 295 to about 705 m²/kg, inclusive of both endpoints and all numerical values therebetween, where the ratio is measured by laser diffraction. Methods of producing such products are also disclosed.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2015/049839

A. CLASSIFICATION OF SUBJECT MATTER

INV. C01F7/56

ADD.

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)

C01F

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)

EP0-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 5 985 234 A (DULKO JAMES M [US]) 16 November 1999 (1999-11-16) examples	1-6,26
X	EP 0 530 598 A1 (SOLVAY WERKE GMBH [DE]) 10 March 1993 (1993-03-10) page 2, lines 36-53 examples	1-6,26



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

"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

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YANG LI ET AL: "Characteristics of High-purity Polyaluminum Chloride Species Prepared by Homogeneous Alkalization", NATURAL SCIENCE JOURNAL OF XIANGTAN UNIVERSITY, vol. 27, no. 4, 1 January 2005 (2005-01-01), pages 68-72, XP055244430, DOI: 10.13715/i.cnki.nsjxu.2005.04.014 abstract tables 1,2	1-6,26
X	----- US 3 876 758 A (BEEKMAN STEWART M) 8 April 1975 (1975-04-08) column 3, line 45 - column 4, line 10 column 7, lines 10-15 examples	1-6,26
X	----- DD 273 824 A1 (MANSFELD KOMBINAT W PIECK VEB [DD]) 29 November 1989 (1989-11-29) page 2, lines 3-9 examples	7-26
X	----- WO 90/08738 A1 (CAFFARO SPA IND CHIM [IT]) 9 August 1990 (1990-08-09)	26
A	page 2, line 19 - page 3, line 20 examples	7-25
X	----- WO 01/97768 A2 (COLGATE PALMOLIVE CO [US]) 27 December 2001 (2001-12-27)	26
A	page 6, lines 2-28 page 12, lines 23-31 page 13, lines 6-36 examples -----	7-25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/049839

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.: 1-6(partially)
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:
see FURTHER INFORMATION sheet PCT/ISA/210
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.:

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: 1-6

Aluminum chlorohydrate product comprising aluminum chlorohydrate particles in fractured crystal form having a basicity in the range 50-85.6% and a surface area of 295-705 m²/g as measured by laser diffraction.

2. claims: 7-26

Process for producing aluminum chloride hydrate particles of desired basicity comprising treating aluminum chloride hexahydrate crystals with a high temperature gas stream in a circular mill at constant temperature and aluminum chlorohydrate obtained therefrom.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 1-6(partially)

Present claim 1 relates to a product defined (inter alia) by reference to the following parameter:

"surface area to weight ratio of 295 to 705 m² /kg as measured by laser diffraction".

In an invitation to provide informal clarification dated 11.12.2015, the applicant has been informed that the use of this parameter in the present context is considered to lead to a lack of clarity, because the claim does not clearly identify the products encompassed by it, as the parameter cannot be clearly and reliably determined by indications in the description or by objective procedures which are usual in the art. As a result, the application does not comply with the requirement of clarity under Article 6 PCT. Furthermore, the attention of the applicant has been drawn to the fact that the application also lacks disclosure, as there is no indication in the whole application how the claimed parameter is to be measured (Article 5 PCT).

In reply to the invitation to file a statement indicating the subject-matter to be searched, the applicant argued that the application provides sufficient information how to produce the claimed particles (reference is made to p.7 [033]-p.10 [047]) and that the fractured crystal product is described at p.11 [050] and Tab.2. The applicant states that for the measurements of the specific surface area a commercially available Malvern Masterizer 3000 instrument has been used and provided the user manual of such instrument (Exhibit 1). Chapter 5 of the user manual describes the measurements and the analytical processes that can be performed using the Malvern instrument; in particular, p.5-18 describes the measurement of the specific surface area.

Additionally, as the application describes laser diffraction as a method for determining surface areas per unit of weight according to ISO 13320:2009 (see p.6 [030]), the applicant provided as Exhibit 4 the International Standard for laser diffraction.

The argumentation of the applicant cannot be followed:

The use of laser diffraction technology to characterize various particle parameters including the specific surface area is based on certain assumptions, that are explained in the International Standard ISO 13320:2009. The technique assumes a spherical particle shape in its optical mode. It must be noted that the resulting particle size distribution may be different from that obtained by other methods based on physical principles for non-spherical particles (see Exhibit 4 p.1 "1 Scope"). Additionally, error sources are explained on page 17 under section 6.6 - systematic measurement errors arise from departure from the theoretical assumptions for the particulate material, i.e. asphericity, surface roughness, optical heterogeneity, etc. On p.37 under section A.11 the effect of particle shape is shown.

Moreover, the user manual for the Malvern instrument in the passage cited by the applicant describes that the density of the material should be defined and that the mathematical

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

calculations are based on the assumption that the particles are both spherical and non-porous.

The particles defined in claim 1 of the present application have "fractured crystal form" (see claim 1) and according to Fig.6, which is a SEM image of particles according to the invention (see p.6 [025]), are not spherical.

It is clear that the assumptions necessary to calculate the surface area to weight ratio from laser diffraction measurements, as explained by the applicant, do not apply to the claimed particles. Moreover, neither the application nor the cited documents provide indication how the ratio surface area/weight of fractured particles can be determined from particle size distribution measured by laser diffraction.

In view of the above arguments the values indicated in claim 1 for the surface area to weight ratio are not comparable with corresponding values in prior art products when the ratio is measured/calculated in a different way.

It follows that claim 1 characterised by the contested parameter does not fulfil the requirements of Art.5 and 6 PCT.

The applicant failed to indicate in his reply the subject-matter that could possibly form a basis for a search for the invention first mentioned in the claims.

The lack of clarity and disclosure is to such an extent, that a search could not be carried out over the whole scope of claim 1.

The search was performed taking into consideration the non-compliance in determining the extent of the search for claim 1, i.e. the objected feature has not been taken into account. The search of claim 1 was consequently restricted to

"An aluminum chlorohydrate product comprising particles of aluminum chlorohydrate, in fractured crystal form, having a basicity in a range of 50% to 85.6%."

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/049839

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