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**Datasheet for the decision  
of 1 February 2024**

**Case Number:** T 1222/22 - 3.3.06

**Application Number:** 07811609.2

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B01J35/02, B01J35/10

**Language of the proceedings:** EN

**Title of invention:**  
Rare earth alumina particulate manufacturing method and  
application

**Patent Proprietors:**  
Pacific Industrial Development Corporation  
Weihai Pidc New Materials Company

**Opponents:**  
Rhodia Operations  
Sasol Germany GmbH

**Headword:**  
Rare earth alumina/PACIFIC

**Relevant legal provisions:**  
EPC Art. 123(2)

**Keyword:**

Amendments (all requests) - unsupported intermediate  
generalisation

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
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Case Number: T 1222/22 - 3.3.06

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.06**  
**of 1 February 2024**

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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
7 March 2022 concerning maintenance of the  
European Patent No. 2190574 in amended form.

**Composition of the Board:**

**Chairman** J.-M. Schwaller  
**Members:** L. Li Voti  
C. Heath

## **Summary of Facts and Submissions**

- I. Both the patent proprietors and opponent 1 appealed the decision of the opposition division to maintain European patent no. 2 190 574 in amended form on the basis of auxiliary request 37 filed during oral proceedings on 8 February 2022.
- II. With their statement of grounds of appeal, the patent proprietors filed twenty sets of claims as main request and auxiliary requests 1 to 19, respectively, with auxiliary request 12 corresponding to the request found allowable by the opposition division.
- III. In its statement of grounds of appeal, Opponent 1 inter alia raised objections under Article 123(2) EPC.
- IV. Opponent 2 and party as of right also argued in its reply to the proprietors' appeal that the main request and auxiliary requests 1 to 11 did not comply inter alia with the requirements of Article 123(2) EPC.
- V. In its preliminary opinion, the board informed the parties that none of the requests on file appeared to comply with the requirements of Article 123(2) EPC.
- VI. With letter dated 29 November 2023, the patent proprietors withdrew the previous main request as well as auxiliary requests 1 to 11 and 16 to 19, and filed twenty further sets of claims as new main request and auxiliary requests 1 to 19, with the main and first to third auxiliary requests corresponding to the previous auxiliary requests 12 to 15, respectively.

VII. At the oral proceedings held on 1 February 2024, the patent proprietors withdrew their appeal so that the final parties' requests were the following:

The appellant/opponent 1 requested that the decision under appeal be set aside and the patent be revoked.

The (now) respondents/patent proprietors requested that the patent be maintained in amended form on the basis of the main request, or as an auxiliary measure, that the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 19, all the requests as filed with letter dated 29 November 2023.

VIII. Claim 1 according to the main request reads as follows:

*"1. A calcined alumina catalyst support with at least one rare earth oxide as a stabilizer having a chemical formula  $(RE_x, Al_{1-x})_2O_3$ , in which RE denotes one or more rare earth elements selected from the group: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er and Tm; the calcined alumina catalyst support having a rare earth molar content x of 0.005 to 0.04; the alumina catalyst support obtainable by*

- a. preparing a basic solution containing  $Al_2O_3$  and an acidic solution containing at least one rare earth nitrate,*
- b. mixing together the basic and acidic solutions causing wet continuous coprecipitation in the form of a slurry, wherein said mixing is performed using a static mixer together with a tank reactor with a stirrer,*
- c. aging the coprecipitation slurry and optionally adding one or more surfactants during the aging,*
- d. separating the coprecipitate from the solution to obtain a wet cake precipitate,*

*e. washing the wet cake precipitate to remove remnants of the solution containing any elements tending to poison the catalyst and thereby to produce a pure rare earth alumina,*  
*f. drying the rare earth alumina, and*  
*g. calcining the rare earth alumina at 500 to 1.000°C for 3 to 10 hours to obtain the alumina catalyst support;*  
*the alumina catalyst support thus having high thermal stability so that even after further calcination at 1.200°C for 50 hours, the alumina catalyst support consists of the rare earth alumina in the form of a pure theta phase absent the presence of any alpha phase."*

The wording of claim 1 of auxiliary requests 1 to 3 and 5 to 19 differs from that of the main request in that it requires additionally one or more of the following features/amendments:

- the basic solution of step (a) is  $\text{NaAlO}_2$  in which the  $\text{Al}_2\text{O}_3$  content is 50-400g/L,
- the rare earth alumina of step (g) is characterised by gamma or gamma plus delta phases,
- the acidic solution of step (a) is aqueous,
- the static mixer of step (b) is comprised of multiple right and left-handed screw passages,
- the wording "*absent the presence of any alpha phase*" at the end of the claim is deleted.

Claim 1 according to auxiliary request 4 is instead identical to claim 1 of the main request.

## Reasons for the Decision

1. Main request - Article 123(2) EPC
  - 1.1 Claim 1 of this request relates to a calcined rare earth alumina catalyst support having a defined chemical formula, obtainable by a process having the listed steps (a) to (g) and further characterised in that it has *"high thermal stability so that even after further calcination at 1200°C for 50 hours, the alumina catalyst support consists of the rare earth alumina in the form of a pure theta phase absent the presence of any alpha phase"* (in the following **"the theta phase feature"**).
  - 1.2 With regard to the claims of the application as filed (reference being made to the application published as WO 2009/029070 A1), the board notes that a rare earth alumina catalyst support having the chemical formula of claim 1 at issue is disclosed in claims 1 and 2 as filed. However, neither the product claims, nor claim 25 as filed relating generically to a method of manufacturing an alumina catalyst support comprising process steps (a) to (g) - with certain steps being not identical to the steps (a) to (g) defined in claim 1 of the main request - contain the theta phase feature or any feature explicitly relating to the appearance of a theta phase during calcination at high temperature.

Therefore, the claims as originally filed do not contain a support for the wording of claim 1 at issue.
  - 1.3 As regards the description as originally filed, a rare earth alumina having a chemical formula as required in claim 1 at issue is disclosed at page 4, lines 22-28

under the heading "Detailed description of the invention", also disclosing (page 5, lines 5-16) that the new rare earth alumina has a porous structure with different phases depending on calcination temperature, including the theta phase feature, and that it is produced in a wet continuous coprecipitation method disclosed more in detail on page 5, line 17 ff and including inter alia the steps (a) to (g) defined in claim 1 at issue. Under the same heading at page 5, lines 1-4, the description as filed discloses the new rare earth alumina as having "*a particle size distribution ranging from 1-80 microns with median size  $D_{50}$  of 5 to 15 microns, a fresh pore volume of 0.5 to 1.2 cc/g and a fresh surface area of 130-250 m<sup>2</sup>/g after calcination at 500 to 900°C for 4-10 hours*", with these features being neither described as optional or preferred, but as defining the product according to the invention, and so being essential for the performance of the invention.

It is thus directly apparent from the above that this part of the description does not contain a disclosure of a rare earth alumina characterised solely by the theta phase features, as presently required by claim 1 at issue.

- 1.3.1 As regards the respondent's argument that the above features defining the "new rare earth alumina" relate to a different, separate, preferred embodiment of the invention since they are obtained after calcination at 500 to 900°C for 4-10 hours, i.e. under calcination features which are not identical to those of method step (g) characterising the claimed product, the board remarks that claim 1 at issue requires in step (g) a calcination at 500 to 1000°C for 3 to 10 hours, i.e. ranges of calcining temperature and period very close

to and entirely encompassing those disclosed in combination with the features of the "new rare earth alumina". Moreover, the board notes that a product for example **obtainable by** calcining for 3 hours at 500°C, as encompassed by said step (g), may well have all the features of the "new rare earth alumina" reported in page 5 when calcined at the same temperature for 4 hours. It is also to be noted that the calcination temperature reported in the detailed description of the applied method of preparation (page 8, lines 1-3) includes preferred calcining temperature of 550 to 900°C and a calcining period of 4 to 6 hours, which are fully in accordance with the calcining conditions of the "new rare earth alumina" discussed above.

Therefore, the board cannot find any contradiction between the features of the "new rare earth alumina" and step (g) of the method required by claim 1 at issue, so that there is no plausible reason for considering them to relate to a different, separate, preferred embodiment of the invention.

- 1.3.2 Moreover, the fact that the features defining the "new rare earth alumina" are also disclosed in isolation in claims 5 and 6 as originally filed, both being only dependent on claim 1 and not linked to any other claims, cannot be seen as a support for the embodiment of claim 1 at issue, which requires the additional theta phase feature.

In fact, the board notes that the features at page 5 defining the "new rare earth alumina" are also disclosed under the heading "Summary of the invention" (page 3, lines 23-30) wherein the rare earth alumina is stated to have inter alia no alpha phase after calcination at 1200°C for 50 hours, i.e. having

at least part of the above discussed theta phase feature.

Hence, in the board's view, the above discussed features defining the "new rare earth alumina" are disclosed in the description as being essential and inextricably linked to each other.

1.4 The board therefore concludes that the wording of claim 1 at issue that does not contain the features defining the "new rare earth alumina", is an unsupported intermediate generalisation of the invention as originally disclosed (see Case Law of the Boards of appeal 10th edition, July 2022, Chapter II.E.1.9.1) so that claim 1 does not comply with the requirements of Article 123(2) EPC.

1.5 The main request is thus not allowable.

1.6 The same conclusion applies to auxiliary request 4, as its claim 1 is identical to that of the main request.

2. Auxiliary requests 1 to 3 and 5 to 19 - Article 123(2) EPC

2.1 The wording of claim 1 of these requests differs from that of the main request in that it requires additionally one or more of the following features/ amendments:

- the basic solution of step (a) is  $\text{NaAlO}_2$  in which the  $\text{Al}_2\text{O}_3$  content is 50-400g/L,
- the rare earth alumina of step (g) is characterised by gamma or gamma plus delta phases,
- the acidic solution of step (a) is aqueous,

- the static mixer of step (b) is comprised of multiple right and left-handed screw passages,
- the wording "*absent the presence of any alpha phase*" at the end of the claim is deleted.

2.2 It is however directly apparent that none of these claims contain the above discussed "new rare earth alumina" features, so that the wording of all these claims still amounts to an unsupported intermediate generalisation of the original disclosure, and so, for the same reasons explained above, none of these claims complies with the requirements of Article 123(2) EPC, and none of these auxiliary requests is allowable.

## Order

### **For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated