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**Datasheet for the decision
of 26 March 2021**

Case Number: T 1942/18 - 3.3.06

Application Number: 04818425.3

Publication Number: 1687084

IPC: B01J27/122, B01J23/72,
B01J21/04, C07C17/15

Language of the proceedings: EN

Title of invention:

Catalyst and gas phase method using such a catalyst

Patent Proprietor:

Inovyn Europe Limited

Opponent:

Clariant Prodotti (Italia) SPA

Headword:

Titanium-containing catalyst/INOVYN

Relevant legal provisions:

EPC Art. 54, 56, 83, 123(2)

RPBA Art. 12(4)

Keyword:

Sufficiency of disclosure - (yes)

Amendments - allowable (yes)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1942/18 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 26 March 2021

Appellant:
(Patent Proprietor)

Inovyn Europe Limited
Runcorn Site HQ
South Parade
PO Box 9
Runcorn, Cheshire WA7 4JE (GB)

Representative:

King, Alex
Mathisen & Macara LLP
Communications House
South Street
Staines-upon-Thames, Middx TW18 4PR (GB)

Respondent:
(Opponent)

Clariant Prodotti (Italia) SPA
Via Vittor Pisani, 20
20124 Milano (IT)
- Opposition withdrawn -

Representative:

Modiano, Micaela Nadia
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 29 May 2018
revoking European patent No. 1687084 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

- I. The appeal is from the decision of the Opposition Division to revoke European patent no. **1 687 084**.
- II. With its statement of grounds the proprietor (the appellant) defended the patent as granted and filed eight sets of amended claims as 1st to 8th auxiliary requests. With a letter dated 2 July 2019 it filed a new 6th auxiliary request and renumbered former 6th to 8th auxiliary requests as 7th to 9th auxiliary requests.
- III. Following documents are relevant for this decision:
- D4: US 2002/0007097 A1
- D8: Product Information "*High purity activated aluminas PURALOX[®] CATALOX[®]*" by CONDEA, 10/99
- D9: Product Information "*High Purity Aluminas PURALOX[®], CATALOX[®]*" by CONDEA, 04/99
- D15a, D16, D17: Documentation regarding catalysts for oxychlorination delivered by Süd-Chemie Catalysts Italia S.r.l in 2002
- D20: "*TECHNICAL REPORT on TESTS carried out in the context of an Opposition against SOLVAY Patent EP1687084*" by Dr. C. Orsenigo, 12 October 2016;
- D26: "*Developing raw materials for the catalyst industry*" by K. Noweck and T. Lüdemann, CONDEA Chemie GmbH, prepared for presentation at CatCon'96 October 29-30, 1996

D27: US 6,740,621 B2

- IV. In response to the board's preliminary opinion, the respondent withdrew its opposition.
- V. During oral proceedings before the board, the appellant withdrew its main request. Its final requests were that the decision under appeal be set aside and that the patent be maintained on the basis of one of the 1st to 5th auxiliary requests, all filed with the statement of grounds dated 5 October 2018, or of one of the 6th to 9th auxiliary requests, filed with letter dated 2 July 2019.
- VI. Independent claims 1, 7 and 8 of the 1st auxiliary request read as follows:

"1. Catalyst containing active elements including copper deposited on an alumina, said alumina containing at least 0.2 g of titanium, expressed in metal form, per kg of alumina, and said alumina having a mean particle diameter between 5 and 200 μm , characterized in that the alumina results from the calcination of an aluminum hydrate and in that the titanium has been introduced in one of the steps of the aluminum hydrate production."

"7. Use of an alumina containing at least 0.2 g of titanium, expressed in metal form, per kg of alumina, and having a mean particle diameter between 5 and 200 μm as support for catalyst containing active elements including copper, characterized in that the alumina results from the calcination of an aluminum hydrate and in that the titanium has been introduced in one of the steps of the aluminum hydrate production."

"8. Method involving a gas phase reaction, characterized in that the gas phase reaction is catalysed by a catalyst according to any one of claims 1 to 6."

Dependent claims 2 to 6 and 9 to 11 concern specific embodiments of the claimed catalyst and method.

Reasons for the Decision

1. Admittance

The first auxiliary request being new, but filed with the grounds of appeal in reaction to the decision of the opposition division that claim 1 as granted lacked novelty over D4, the board decided to admit it into the proceedings under Article 12(4) RPBA 2007.

2. Sufficiency of disclosure (Article 83 EPC)

As decided by the opposition division and communicated by the board in its provisional opinion, the claimed invention is sufficiently disclosed since the patent ([0010]-[0014], [0036] and examples) discloses how to prepare the claimed catalysts and the method for preparing an alumina having the required amount of titanium is well-known in the art (see e.g. D26 and D27).

3. Compliance with the requirements of Article 123(2) EPC

3.1 Claims 1 and 7 at issue differ from claims 1 and 8 as granted in that the alumina content of titanium is of at least 0.2 g instead of at least 0.03 g.

3.2 This amendment being supported by the passage on page 2, lines 12-13 of the application as filed (in its version published as WO 2005/046866 A2), which discloses the value of at least 0.2 g as particularly preferred, and the other claims having not been amended but only renumbered or adapted where necessary, the claims of this request comply with the requirements of Article 123(2) EPC.

4. *Novelty (Article 54 EPC)*

4.1 Document D4 (example 1 and comparative example 1) discloses gas phase oxychlorination catalysts obtained by impregnating an alumina support with a solution of promoters including copper. The supports used are Puralox[®] SCCa 5/150 (a δ -Al₂O₃ from Condea) and Puralox[®] SCCa 5/200 (a γ -Al₂O₃ from Condea). D4 does not disclose how such aluminas have been prepared nor their mean particle size and Ti content.

4.2 Documents D8 and D9 are product informations by Condea relating inter alia to various classes (gamma, delta or theta phase) of Puralox[®] and Catalox[®] aluminum oxides including the Puralox[®] SCCa-(90-210) class of alumina of which two representatives are disclosed in D4. According to D8 and D9 the Puralox[®] series SCCa-(90-210), which includes both aluminas exemplified in D4, have a particle size (d₅₀) ranging from 60 to 150 μ m, and so a mean particle size which inevitably fall within the range of 5 to 200 μ m defined in claim 1 at issue.

4.3 As regards the chemical purity of these commercial products, D8 and D9 report a TiO₂ content of 0.01-0.20%, i.e. a range of about 0.06 to 1.2 g Ti, expressed in metal form per kg of alumina, which

includes the lower limit of 0.2 g defined in claim 1 at issue.

4.4 It is not in dispute that the PURALOX[®] aluminas are obtained by calcination of the corresponding PURAL[®] alumina hydrates and that the PURAL[®] alumina hydrates (see D26: pages 3-5 and D27: column 8, lines 8-33) were prepared by Condea according to two different methods, namely a first one involving the separation of the alumina hydrate as by-product of the Ziegler ALFOL process, wherein the oxidation step of the process is catalysed by an organic titanium compound so that TiO₂ impurities remain necessarily in the separated alumina hydrate, or, alternatively by a method involving the reaction of alcohol with high purity aluminum powder, which method leads to alumina containing no substantial titanium impurities.

4.5 It is observed that document D27 has been published between the priority and filing date of the patent, but the board finds its technical information regarding the preparation of these prior art Condea aluminas extremely relevant.

Furthermore D27 (column 7, lines 56-57) discloses that commercially available boehmite PURAL[®] γ -alumina products (supplied by Condea/Vista) typically have varying titanium impurity levels of up to about 600 ppm (i.e. up to 0.6 grams per kg) and that (column 8, lines 43-56) *"of the commercial synthetic boehmite products presently available in the market, some are produced by the Ziegler process, others are produced by the aluminum alkoxide hydrolysis process, and still others are produced by a combination of these processes wherein the resulting products or product precursors are blended together. Such products are sold and used*

interchangeably, without regard to the small amount, if any, of the titania present. Thus the amount of titanium present in commercial γ -alumina supports (PURAL[®] and others) can vary from 0 ppm to as high as 3000 ppm titanium by weight or more. Titanium concentrations can also vary significantly between different batches of the same commercial product".

- 4.6 The appellant did not dispute that the classes of commercially available alumina products listed in D8 and D9 had typically amounts of TiO₂ impurities as indicated in these documents but emphasised that some commercial products could be titanium-free or could contain very low amounts of titanium outside the range of D8 and D9.
- 4.7 For the board it follows from the above considerations that the commercially available Puralox[®] SCCa 5/150 and Puralox[®] SCCa 5/200 of D4 certainly contained some titanium, but there is definitely no evidence on file that these products contained necessarily an amount of titanium of at least 0.2 g, expressed in metal form, per kg of alumina. Therefore, in the Board's judgement, D4 does not disclose directly and unambiguously a catalyst having all the features of claim 1 and is not novelty-destroying.
- 4.8 As regards the alleged prior uses D15A, D16 and D17 discussed in writing, the board has no reason to diverge from its preliminary opinion that it cannot be directly and unambiguously derived from the evidence on file that the aluminas delivered by Sasol to Süd-Chemie MT srl were actually used in the preparation of the copper-promoted catalysts subsequently sold by Süd-Chemie. Therefore, these alleged prior uses are not relevant for the assessment of novelty.

4.9 As further indicated in the board's preliminary opinion, the novelty objection based on D27 has to be disregarded since it has not been established that this document was prior art under Article 54(2) EPC.

4.10 The board therefore concludes that the subject-matter of claim 1 (and by the same token that of claims 2 to 11 which depend thereon) of the first auxiliary request is novel over the cited prior art.

5. *Inventive step (Article 56 EPC)*

Claim 1 at issue concerns a catalyst containing active elements including copper deposited on alumina, wherein the alumina has a specified titanium content.

5.1 As explained in paragraphs [0003] and [0006] of the patent, it was known to use catalysts containing active elements including copper deposited on alumina in gas phase reactions like the oxychlorination of hydrocarbons. Moreover, it was customary to recycle the tail gases produced in such reactions. Further, as explained in paragraph [0007], "*Insofar as a combustible gas is recycled via a compressor, the oxygen content of this gas plays a key role in maintaining the safety of the system. Depending on the pressures and temperatures encountered, various oxygen limitations are imposed. This is why operation with a stable oxygen profile in the tail gases is an important industrial advantage from the standpoint of safety and control of an industrial reactor...*"

In paragraph [0008] the patent discloses the problem underlying the invention as being to provide a catalyst which is suitable in a gas phase oxychlorination for

maintaining a constant oxygen content in the tail gases and hence in the recycled gases.

- 5.2 It is undisputed that the cited prior art documents do not deal with this specific problem.

Notwithstanding, the board considers D4 to represent the most suitable starting point for the evaluation of inventive step, as this document discloses (paragraph [0007]) oxychlorination catalysts having improved properties. In particular, the method disclosed in its example 1, which involves the use of Puralox[®] SCCa 5/150 impregnated with copper, magnesium and potassium as a catalyst, is considered to represent the closest prior art.

- 5.3 Examples 2 and 5 of the present patent show that by using a catalyst as claimed (namely containing 1.13 g titanium per kg of alumina) the oxygen content in the tail gases produced in the oxychlorination of ethylene remains fairly constant over time during a 24 hours test period (see plot A in figures 1 and 3). It is accepted that these examples were carried out in an industrial reactor and imply a recycling of the tail gases and that the same stability shown in figures 1 and 3 will necessarily be present in the recycled gases.

In contrast, this is not the case (see example 4 and plot A in figure 2) when using under comparable reaction conditions a catalyst which contains only 0.015 g titanium per kg of alumina, i.e. a value inferior to the lower limit of 0.2 g required in claim 1 at issue.

5.3.1 The board agrees with the appellant that the experimental report D20 filed during opposition cannot disprove the clear technical advantage shown in the examples of the patent since the tests were carried out discontinuously for only 8 hours and on a pilot plant not including recycling of the tail gases.

Therefore these tests were carried out under conditions very different from those applied in the examples of the patent and are thus not relevant in view of the problem underlying the patent, namely providing a catalyst which is suitable in a gas phase oxychlorination for maintaining a constant oxygen content in the tail gases and in the recycled gases.

5.3.2 The Board thus accepts that the technical problem underlying the claimed invention is that identified above and that it has been convincingly solved by means of a catalyst having all the features of claim 1.

5.4 Since none of the cited documents suggests that a variation of the titanium content in the alumina particles of an oxychlorination catalyst may bring about the technical advantage convincingly shown in the patent, the board is convinced that the skilled person, starting from a catalyst as disclosed in the examples of D4 and faced with the technical problem posed, was not induced by the prior art to look for a similar catalyst prepared by a method that would have resulted necessarily in a titanium content, expressed in metal form, of at least 0.2 g per kg of alumina as required by claim 1.

5.5 The Board therefore concludes that the subject-matter of claim 1 at issue (and by the same token that of claims 2 to 11 which depend thereon) was not obvious

from the state of the art and so involves an inventive step (Articles 52(1) and 56 EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of claims 1 to 11 according to the first auxiliary request filed with the statement setting out the grounds of appeal dated 5 October 2018 and a description to be adapted.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated