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DECISION
of 9 August 1996

Case Number: T 0451/93 - 3.3.2

Application Number: 90303396.7

Publication Number: 0448858

IPC: B01J 23/62

Language of the proceedings: EN

Title of invention:
Hydrocarbon dehydrogenation catalyst

Applicant:
UOP

Opponent:
-

Headword:
Catalyst/UOP

Relevant legal provisions:
EPC Art. 54

Keyword:
"Novelty (yes, after amendment of the claims)"

Decisions cited:
-

Catchword:
-

Case Number: T 0451/93 - 3.3.2

DECISION
of the Technical Board of Appeal 3.3.2
of 9 August 1996

Appellant:

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Representative:

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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 8 December 1993 refusing European patent application No. 90 303 396.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P. A. M. Lançon
Members: M. M. Eberhard
R. E. Teschemacher

Summary of Facts and Submissions

I. European patent application No. 90 303 396.7 was refused by the Examining Division. The decision was based upon the amended claims filed on 28 October 1992.

II. The ground for the refusal was that the amended claims 1 and 5 did not meet the requirement of novelty set out in Article 54 EPC. The Examining Division held that each of the documents US-A-3 878 131, US-A-3 998 900 and DK-A-127 806 (hereinafter D2, D3 and D4 respectively) destroyed the novelty of the product and process as defined in these claims. According to the decision, the combination of all the claimed features was disclosed in these documents since each of them described preferred carriers having an apparent bulk density (ABD) of 0.7 g/cm^3 and a surface area of 100 m^2/g as well as the use of theta-alumina as a suitable carrier material. It was not relevant that theta-alumina was not considered as a preferred embodiment in these documents.

III. The Appellant lodged an appeal against this decision and filed five sets of amended claims together with the Statement of Grounds of Appeal. The Appellant argued that there was a general reference in D2, D3 and D4 to the possibility of using theta-alumina, but it was made clear that gamma- or eta- alumina gave the best results and the only material which was discussed in any detail at all was gamma-alumina. The Appellant submitted that the preferred parameters should be read in conjunction with one another, unless it was clearly indicated that they were intended to relate to alternatives and not to the same thing. D2, D3 or D4, made clear that the preferred alumina was gamma-alumina, and that the preferred material had certain characteristics of surface area. On a proper reading this information should be read together. The Appellant also put forward arguments regarding the novelty of the claimed catalytic composite over the disclosure of the document EP-A-0 196 758 (D1).

IV. In a communication pursuant to Article 110(2) EPC, the Board questioned the allowability of the amendments in the claims filed with the Statement of Grounds of Appeal and the novelty of certain claims with respect to catalyst A disclosed in example 1 of D1. In reply thereto, the Appellants submitted, on 12 April 1996, comparative tests and four sets of amended claims as main request, first, second and third auxiliary requests respectively. Claim 1 of the main request reads as follows:

"1. A catalytic composite comprising a combination of a Group VIII noble metal component, an alkali or alkaline earth metal component, and a third component selected from tin, germanium, lead, indium, gallium, thallium, or mixtures thereof, and an alumina support, characterised in that the support consists essentially of alumina crystallites having at least 75% of theta-alumina crystallites, and in that the catalytic composite has a surface area from 80 to 100 m^2/g and an ABD of 0.5 g/cm^2 or more."

The independent claim 7 relates to "a process for the dehydrogenation of dehydrogenatable hydrocarbons comprising contacting a dehydrogenatable hydrocarbon at hydrocarbon dehydrogenation conditions with a catalyst according to any of Claims 1 to 6."

The Appellant further argued that because of the restriction to the surface area of the catalysts, D1 could not be considered as destroying the novelty of the invention as claimed since catalyst A of example 1 of D1 was specified in D1 as having a surface area which was outside the range claimed in the revised claims.

V. The Appellant requested that a patent be granted on the basis of the claims according to the main request filed on 12 April 1996 or alternatively on the basis of the claims of the first, second or third auxiliary request filed on the same date. Oral proceedings were also requested in the event the Board might come to a contrary conclusion.

Reasons for the Decision

1. The appeal is admissible.

2. The amended claims of the main request are considered to meet the requirements of Article 123(2) EPC. Claim 1 is based on the combination of claim 1 as originally filed with features disclosed in the original description. In particular the limitation regarding the amount of theta-alumina crystallites in the alumina support is disclosed at page 9, lines 25 to 27, of the application as filed. The restricted range for the surface area of the catalytic composite is supported by the values of surface area given in the original description at page 15, Table 1, and at page 18, lines 13 to 16. Claims 2 to 4 and 6 to 10 correspond to the original claims 3 to 5, 2, and 6 to 9 respectively. The features of the dependent claim 5 are disclosed at page 9, lines 30 to 31 of the description.

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3. Turning to the novelty issue, it is observed that the catalytic composite as defined in claim 1 of the main request is novel over the disclosure of D1. This document discloses in particular a catalyst comprising a combination of platinum, tin and lithium compounds on an alumina support (cf. catalyst A of example 1). This catalyst was prepared by a method comprising the steps of calcining alumina extrudates containing a tin component at a temperature of 1040°C, impregnating the calcined extrudates with a chloroplatinic acid solution and a lithium nitrate solution, drying, and calcining the catalyst at a temperature of 650°C. The resulting catalyst has a surface area of 106 m^2/g and a piece density of 1.51 g/cm^3. As claim 1 of the main request has been restricted to catalysts having a surface area from 80 to 100 m^2/g, the claimed catalyst differs from catalyst A of example 1 at least by the lower value of surface area. The other catalysts exemplified in this document are less relevant than catalyst A. The combination of features recited in claim 6 of D1 does not destroy the novelty of the claimed catalyst since it is not directly and unambiguously derivable from the said claim that at least 75% of the alumina crystallites are theta-alumina crystallites in an alumina support having a surface area of 80 m^2/g .

3.1 The Board also considers that the catalytic composite of claim 1 is new with respect to the disclosure of D2 for the following reasons:

D2 discloses a catalytic composite comprising a combination of a platinum group metal, tin oxide, a germanium oxide and an alkali or alkaline earth material on a porous carrier material, preferably on a refractory inorganic oxide such as alumina (cf. claims 1, 5 and 6). All the catalysts of the examples are prepared by two impregnation steps, using gamma-alumina particles as the porous carrier material. Between the two impregnation steps, the impregnated particles are dried and submitted to a calcination at a temperature of maximum about 1000°F (i.e. about 538°C), followed by a treatment in an air stream containing steam at a temperature of about 1000°F for about 5 hours. After the final calcination, the catalyst is reduced at a temperature of about 1050°F for one hour with dry hydrogen (see column 15, lines 13 to 50). Taking into account that the two calcination steps, the heat treatment in the presence of steam and the reduction were performed at temperatures at which the gamma-alumina is normally not converted into theta-alumina, the claimed catalyst differs at least from the exemplified catalysts of D2 by the nature of the support.

According to col. 5 of D2, the porous carrier materials for use in the catalysts of D2 exhibit a surface area of 25 to 500 m²/g. Six groups (1) to (6) of possible carrier materials including more than thirty different compounds and their combination with one another are then recited at lines 35 to 55. Thereafter, it is pointed out that the **preferred porous carrier materials** are refractory inorganic oxides (i.e. group (4)), with best results obtained with an alumina carrier material; suitable aluminas being gamma-, eta- and theta-aluminas, with gamma- or eta-alumina giving best results. It is then disclosed that the alumina carrier material may contain minor proportions of other well known refractory inorganic oxides, and that however, the **preferred support** is substantially pure gamma- or eta-alumina. According to the following passage the **preferred carrier materials** have an apparent bulk density (ABD) of about 0.3 to 0.7 g/cm³ and a surface area of about 100 to 500 m²/g.

The Board can follow the Appellant's arguments that the preferred parameters should be read in conjunction with one another; however, it is not convinced that the only possible construction of the teaching in column 5 of D2 is that the given ranges of ABD and surface area relate to gamma-alumina. Taking into account that in column 5 reference is made, on the one hand, to **refractory inorganic oxides** as being the **preferred porous carrier materials** for use in the invention and, on the other hand, to **substantially pure gamma- or eta-alumina** as being the **preferred support**, the question arises whether the said ranges relate to the substantially pure gamma- or eta-alumina or to the refractory inorganic oxides. This question can remain open since in both possible interpretations the subject matter of claim 1 would be new over D2. In the first alternative, the said ranges would only concern the substantially pure gamma- or eta-alumina, and thus theta-alumina having a surface area of 100 m^2/g and an ABD of 0.7 g/cm^3 would not be disclosed in D2. The second alternative would mean that the refractory inorganic oxides may have an ABD of about 0.3 to 0.7 g/cm^3 and a surface area of about 100 to 500 m^2/g. It is not directly and unambiguously derivable therefrom that both the whole range of values for the ABD and the whole range of values for the surface area apply to each kind of refractory inorganic oxide, or to each form of alumina mentioned in column 5. Nor can it be directly and unambiguously derived therefrom that the lower limit of surface area (100 m^2/g) and the upper limit of ABD (0.7 g/cm^3) are those of the same alumina support, said support being a theta-alumina support. Therefore, a catalytic composite having a surface area and an ABD falling within the ranges stated in claim 1 and comprising a support as defined in said claim is not disclosed in D2.

3.2 The catalysts of D3 and D4 comprise the same kind of porous carrier materials as the catalysts of D2 and the ranges stated in these documents for the ABD and the surface area of the preferred carrier materials are identical to those mentioned in D2 (see D3, column 5, line 21 to column 6, line 3 and D4, page 5, second paragraph , page 6, first paragraph). Thus, the reasons indicated above in connection with these parameters apply likewise to the disclosure of D3 or D4. Therefore, the catalytic composite of claim 1 of the main request is also new over the disclosure of D3 or D4 taken separately. The claimed catalytic composite is also novel with respect to each of the remaining documents cited in the search report.

As the process claim 7 of the main request involves the use of a "catalyst according to any of claims 1 to 6", i.e. the use of a new catalyst, it meets the requirement of novelty.

4. The question whether a catalytic composite having the combination of features as defined in Claim 1 of the main request involves an inventive step or not has not been examined by the Examining Division. Furthermore, it is not clear from the additional comments at the end of the appealed decision which document was considered to represent the closest prior art. The technical problem to be solved starting from the closest prior art was also not established. In these circumstances, the Board finds it appropriate, in accordance with Article 111(1) EPC, to remit the case to the Examining Division for further prosecution.

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It should be taken into consideration that the unit of the apparent bulk density mentioned in claim 1 is not correct and should read g/cm^3 instead of g/cm^2. This clerical error should be corrected if a patent were to be granted on the basis of the main request.

5. In view of the outcome of the decision, there was no reason to hold oral proceedings since they were requested only in the event the Board might come to the conclusion that a patent cannot be granted on the basis of one of the requests on file.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution.

The Register:

P. Martorana

The Chairman:

P. A. M. Lançon