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**Datasheet for the decision
of 8 January 2010**

Case Number: T 2006/07 - 3.3.07

Application Number: 00910374.8

Publication Number: 1077768

IPC: B01J 29/40

Language of the proceedings: EN

Title of invention:

High zeolite content and attrition resistant catalyst, methods for preparing the same and catalyzed processes therewith

Patent Proprietors:

W.R. GRACE & CO.-CONN.

Opponents:

ALBEMARLE Netherlands B.V.

Headword:

-

Relevant legal provisions:

EPC Art. 123(2)(3), 69, 111(1)

Keyword:

"Amendments allowable (yes) - proper basis in the application as filed"

"Extension of scope of protection (no) - proper interpretation of granted claim"

"Remittal to the first instance for further prosecution"

Decisions cited:

G 0011/91, G 0001/93, G 0001/98

Catchword:

-



Case Number: T 2006/07 - 3.3.07

D E C I S I O N
of the Technical Board of Appeal 3.3.07
of 8 January 2010

Appellants:
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 11 October 2007
revoking European patent No. 1077768 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: S. Perryman
Members: F. Rousseau
D. Semino

Summary of Facts and Submissions

- I. The Appellants (Patent Proprietors) lodged an appeal on 11 December 2007 against the decision of the Opposition Division posted on 11 October 2007 revoking European patent 1 077 768, on the ground that none of the requests submitted fulfilled the requirements of Article 123(2) EPC. The decision was based on the patent as granted (main request) and on three sets of claims forming basis for their first to third auxiliary requests submitted with a facsimile letter dated 10 August 2007.
- II. The patent as granted comprised thirty claims, claim 1 reading as follows (the deletions made in the claims as filed being indicated in strikethrough and the additions made, in bold and underlined):
- " 1. A cracking catalyst having attrition resistance and activity for olefin production comprising.
- (a) ~~about 30 to about 85% by weight zeolite having a constraint index of 1 to 12,~~ selected from the group consisting of ZSM-5 and ZSM-11; and
- (b) a binder system comprised of the reaction product of greater than 7 to ~~about 6-24%~~ by weight elemental phosphorus, measured as P₂O₅, based on the weight of the catalyst, and added alumina in an amount ranging from 5 to 10% by weight of the catalyst; ~~and~~
- ~~(c) alumina, wherein added alumina is present in an amount of less than about 10% and total alumina is less than about 30%, by weight of the catalyst,~~

said catalyst having the ability to crack a hydrocarbon feed and further comprising a molar ratio of phosphorus to total alumina of a (*sic*) least 0.2 to 1.9, ~~sufficient to obtain~~ a Davison ~~a~~Attrition ~~i~~Index for the catalyst equal to or less than ~~about~~ 20 and a total alumina content of less than 30% by weight."

- III. The Opponents (Respondents) had requested in the notice of opposition the revocation of the patent in its entirety *inter alia* on the ground that the claims and the specification extended beyond the content of the application as filed (Article 100(c) EPC).
- IV. According to the contested decision, none of the requests submitted met the requirements of Article 123(2) EPC, as the lower limit of "greater than 7%" for the amount of phosphorus, the use of elemental phosphorus and the definition of the binder system in claim 1 of the then pending requests had no basis in the application as filed.
- V. With the statement setting out the grounds for appeal dated 11 February 2008, the Appellants submitted three sets of claims forming the basis for their first to third auxiliary requests, as well as three further sets of claims labelled alternative first to third auxiliary requests. In reply to a communication of the Board sent in preparation for oral proceedings, the Appellants submitted with their letter dated 8 December 2009 seven sets of claims forming the basis for their amended third and fourth to ninth auxiliary requests, as well as seven alternative versions of those sets of claims.

VI. In the course of the oral proceedings before the Board which took place on 8 January 2010, the Appellants no longer maintained the former requests, but submitted a fresh set of eight claims superseding all previous requests. The claims of this sole request read as follows (the deletions made in the claims as filed being indicated in strikethrough and the additions made, in bold and underlined):

- "1. A cracking catalyst having attrition resistance and activity for olefin production comprising
- ~~(a) about 30 to about 85% by weight zeolite having a constraint index of 1 to 12, ZSM-5~~
 - ~~(b) about 6-24% by weight phosphorus, measured as P_2O_5 , and~~
 - ~~(c) alumina, wherein added alumina is present in an amount of less than about 10% and total alumina is less than about 30%, by weight of the catalyst, said catalyst having the ability to crack a hydrocarbon feed and further comprising a molar ratio of phosphorus to total alumina of 0.2 to 1.0 when the zeolite content is 30 to 60% by weight and at least 0.2 to 1.9 when the zeolite content is greater than 60 to 85% by weight, sufficient to obtain a Davison ~~a~~Att~~i~~Index for the catalyst equal to or less than about 20 and an (sic) total alumina content of less than 30% by weight, wherein the catalyst is prepared by~~
- (i) preparing an aqueous slurry comprising zeolite ZSM-5, phosphoric acid, added alumina, wherein the added alumina is from 6.5 to 10% by weight of the total weight of the final catalyst when the zeolite content is 30 to 60% by weight and from 5 to 10% by weight of the total weight of the final

- catalyst when the zeolite content is greater than 60 to 85% by weight, and optionally clay, the phosphoric acid being present in an amount sufficient to provide 7 to 24% by weight phosphorus, measured as P₂O₅, in the final catalyst;
- (ii) spray drying and calcining the resulting slurry to produce a particulate catalyst comprising (a) 30 to 60% by weight or greater than 60 to 85% by weight zeolite and (b) a binder formed by the reaction of the added alumina and phosphoric acid; and
- (iii) recovering the catalyst.

4.2 A catalyst according to claim 13 wherein the catalyst has an Davison aAttrition iIndex of about 10 or less.

~~113.~~ A process for preparing a high attrition resistant catalyst according to claim 1 to 2 comprising (i) preparing an aqueous slurry comprising zeolite having a constraint index of 1 to 12 ZSM-5, phosphorus containing compound, phosphoric acid and added alumina, wherein the added alumina is less than about 10% by weight of the total weight of the zeolite, phosphorus containing compound, alumina, and any optional components, and from 6.5 to 10% by weight of the total weight of the final catalyst when the zeolite content is 30 to 60% by weight and from 5 to 10% by weight of the total weight of the final catalyst when the zeolite content is greater than 60 to 85% by weight, and optionally clay, the phosphoric acid being present in an amount sufficient to provide 7 to 24% by

weight phosphorus, measured as P₂O₅, in the final catalyst;

(ii) spray drying and calcining the resulting slurry to produce a particulate catalyst comprising (a) 30 to 60% by weight or greater than 60 to 85% by weight zeolite and (b) a binder formed by the reaction of the added alumina and phosphoric acid; and

(iii) recovering a catalyst having a Davison attrition index equal to or less than 20 and having a total alumina content of less than about 30% by weight and the ability to crack a hydrocarbon feed.

~~154. A process for chemically and catalytically reacting a hydrocarbon feed comprising contacting the feed under at catalytic reactive conditions with a the catalyst of claim 1 comprising~~
~~(a) about 30 to about 85% by weight zeolite having a constraint index of 1 to 12,~~
~~(b) about 6 to 24% by weight phosphorus, measured as P₂O₅, and~~
~~(c) alumina, wherein added alumina is present in an amount of less than about 10% and total alumina is less than about 30% by weight of the catalyst, said catalyst further comprising a molar ratio of phosphorous to total alumina sufficient to obtain an attrition index for the catalyst equal to or less than about 20.~~

25. A process according to claim ~~154~~ further comprising recovering ethylene and/or propylene from said process.

26. A process according to claim ~~154~~ wherein the process is fluidized.

27. A process according to claim 26 wherein the process is fluidized catalytic cracking of hydrocarbons.
28. A catalyst composition comprising a large pore aluminosilicate and 0.1 to ~~about~~ 90 weight % of a catalyst additive according to claim 1 comprising
- ~~(a) about 30 to about 85% by weight zeolite having a constraint index of 1 to 12,~~
 - ~~(b) about 6-24% by weight phosphorus, measured as P_2O_5 ;, and~~
 - ~~(c) alumina, wherein added alumina is present in an amount of less than about 10% and total alumina is less than about 30% by weight of the total additive,~~
- ~~said additive further having a molar ratio of phosphorous to total alumina sufficient to obtain an attrition index for the additive equal to or less than about 20."~~

VII. The Appellants' arguments can be summarized as follows :

- (a) According to page 7, lines 5 and 6 of the disclosure, the catalyst according to the invention was prepared from zeolite, alumina, phosphorus and optional additional components. There was no disclosure in the application as filed that the added alumina had to react 100% with the phosphorus and that the phosphorus had to be used in a stoichiometric amount with respect to the added alumina. To the contrary the phosphorus reacted with any reactive alumina, including the alumina present in the zeolite and in the clay.

Thus, the phosphorus was partly within the binder formed with the added alumina and partly in the other constituents of the catalyst composition. As could be seen from page 7, lines 20 to 28, the added alumina primarily served to act with phosphorus to form binder for the zeolite. Accordingly, the resulting binder system had to comprise the product of the reaction between added alumina and phosphorus, the meaning of the latter term being explained on page 8, lines 17 to 25. Furthermore, the examples of the patent used phosphoric acid and there was no doubt that added alumina and phosphoric acid would react and form a reaction product. In fact, it was not known how to avoid this reaction. The definition in claim 1 was open so that its definition did not exclude further reaction products being part of the binder.

- (b) The value of 6.5% by weight, defining the lower concentration of added alumina when use was made of 30 to 60% by weight ZSM-5 zeolite, was based on the examples of the application as filed were amounts of added alumina of 6.5, 8 and 10% by weight were used with 40% by weight of zeolite. The value of 6.5% used in Example 1 in three different compositions with 40% by weight ZSM-5 zeolite was generally applicable to the range of 30 to 60% by weight ZSM-5 zeolite.

- (c) Concerning the basis for the range of 7 to 24% by weight defining the amount of phosphorus, measured as P_2O_5 in the final catalyst, it was explicitly stated on page 10, lines 25-26 of the application as originally filed that the amount of phosphorus

could be in every partial range within the range 6-24%, 7% being disclosed as a possible lower limit. Moreover, in view of decision T 594/01 of 30 March 2004, there was no material difference between 7% and greater than 7% as defined in the granted patent since these two limits could not be distinguished within the margin of experimental error. Accordingly, amending the definition of the lower limit of the phosphorus content to be 7% by weight did not extend the scope of protection of the patent as granted.

- (d) The use of the term "elemental" in the expression "elemental phosphorus" had to be considered in its literal meaning as an incorrect technical statement which was evidently inconsistent with the totality of the disclosure of the present patent and the application as filed. This was in agreement with the prior art cited relating to stabilization of zeolite catalysts with phosphorus compounds. Granted claim 9 which referred to claim 1 included the feature that phosphoric acid was used. Therefore the term "elemental phosphorus" used in claim 1 had to comprise "phosphoric acid", otherwise claim 9 would be in contradiction to claim 1. It was furthermore established practice as confirmed by decision T 190/99 of 6 March 2001 that the skilled person, when considering a claim, should rule out interpretations which are illogical or which do not make technical sense. The insertion of phosphoric acid in the present claim in fact limited the definition of the phosphorus

containing compound and therefore did not extend the protection conferred by the patent.

- (e) Thus, the main request satisfied the requirements of Article 123(2) and (3) EPC.

VIII. The arguments of the Respondents can be summarized as follows :

- (a) The application as filed did not contain any basis for defining that a reaction between the added alumina and phosphoric acid occurred. *A fortiori*, the application as filed did not disclose a binder formed by the reaction of the added alumina and phosphoric acid.
- (b) Referring to claims 6 to 8 or to claim 23, it was argued that the range defining the amount of zeolite ZSM-5 in the catalyst as being from 30 to 60% by weight was not defined in relation to a concentration of added alumina of 6.5-10% by weight, but only in relation to a concentration of 3 to 8% by weight. The value of 6.5% by weight taken from Example 1 and Figure 5 was manifestly not independent from the other parameters of the examples in which it was disclosed. Therefore, the combination of a range of 6.5-10% by weight added alumina with a catalyst having 30 to 60 % by weight zeolite ZSM-5 extended beyond the scope of application as filed.
- (c) There was a formal and clear difference between a phosphorus content of "greater than 7 to 24%" as defined in granted claim 1, following an amendment

of the range of phosphorus originally disclosed, and a content "7 to 24%" defined in present claim 1. In view of T 592/99 of 01 August 2002, the amendment in examination proceedings to the range defining the amount of phosphorus provided a technical contribution to the claimed subject-matter within the meaning of G 1/93 (OJ EPO 1994, 541). Consequently, the replacement of the range "greater than 7 to 24%" by "7 to 24%" in claim 1 broadened the scope of the patent. Moreover, no basis could be found for the use of phosphoric acid in combination with 7-24% by weight phosphorus in the final catalyst.

- (d) The expression "elemental phosphorus" had a clear meaning in chemistry, i.e. a compound that consists only of phosphorus atoms. Using elemental phosphorus was not deprived of any technical sense in the context of granted claim 1, as elemental phosphorus although it might be difficult to handle could form other compounds in-situ either with water or oxygen, which compounds could further react with the added alumina. The absence of any mention of "elemental phosphorus" in the specification did not imply that this expression clear in itself should be interpreted differently. Thus, claim 1 as granted did not lack clarity and no need for a different interpretation of that claim arose, in line with the approach followed in decisions T 1018/02 of 09 December 2003. However, new claim 1 defined a different product obtained by the reaction product of phosphoric acid, added alumina, zeolite and optional components such as clay, i.e. a product which contained not only the

reaction product of phosphoric acid with added alumina, but also products formed by the reaction of phosphoric acid with zeolite or clay also present in the slurry. Hence, as claim 1 as granted and claim 1 according to the present main request defined two different products, the scope of protection had been extended.

(e) Therefore, the request neither met the requirements of Article 123(2) EPC, nor those of Article 123(3) EPC.

IX. The Appellants requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims of the main request submitted at oral proceedings on 8 January 2010.

X. The Respondents requested that the appeal be dismissed or that the matter be remitted to the first instance for further prosecution.

XI. At the end of the oral proceedings, the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.

Admissibility of the request

2. The present set of claims has been submitted during the oral proceedings before the Board. It was prompted by the objections raised under Article 123(2) EPC, in

particular in respect of the definition in claim 1 of the patent as granted of "a binder system comprised of the reaction product of greater than 7 to 24% by weight elemental phosphorus, measured as P₂O₅, based on the weight of the catalyst, and added alumina in an amount ranging from 5 to 10% by weight of the catalyst", as well as by the need to avoid the trap of Article 123(3) EPC, when trying to replace it by a definition having a proper basis in the original application. Although the Appellants had been made aware of these difficulties in the Board communication addressing the issues to be discussed at oral proceedings in relation to the requests then on file, it is only at the oral proceedings before the Board that they achieved a full understanding of the nature of the Board's objection against this definition and the proposed corrections in the then pending auxiliary requests. In these circumstances and in the absence of objections of the Respondents to the filing of a new request at this stage of the proceedings, the Board deems it appropriate to provide the Appellants with a further opportunity to overcome the objections raised under Article 123(2) and (3) EPC and to allow the present request into the proceedings.

Article 123(2) EPC

3. In accordance with the established Case Law of the Boards of Appeal of the EPO, the relevant question to be decided in assessing whether the subject-matter of an amended claim extends beyond the content of the application as filed is whether the claim comprises technical information which a skilled person would not have directly and unambiguously derived from the

application as filed, either explicitly or implicitly (Case Law of the Boards of Appeal of the EPO, 5th edition 2006, III.A.2.1).

4. In the present case, the amendments made to claim 1 resulted in a definition of the catalyst in terms of properties, i.e. a cracking catalyst having activity for olefin production and a maximum Davison Attrition Index of 20, and compositional ranges, namely specific amounts of zeolite ZSM-5, phosphorus, total alumina, added alumina and molar ratio of phosphorus to total alumina, the catalyst being further defined by the method by which it can be prepared, including the amount of added alumina. In order to assess whether the combination of these features can be considered to be directly and unambiguously derivable from the application as filed, the content of which includes the description, the claims and the drawing (G 11/91, OJ EPO 1993, 125), it appears more appropriate in the present case not to start from the claims as originally filed, but from the description describing the aim of the invention.

Properties of the catalyst

5. According to page 4, lines 29-30 of the application as filed, the present invention aims at providing an improved catalyst and an improved process using the same to chemically react a hydrocarbon feedstock. It is directed to an attrition resistant zeolite catalyst composition which has high levels of stabilized zeolite (defined as being 30-85%) thereby effectively increasing the catalytic effect in reactions involving hydrocarbon feedstock (page 5, lines 1-11). The

catalyst is disclosed to be suitable for cracking hydrocarbon feed for the purpose of olefin production (page 11, lines 16-19; page 12, lines 1-5; page 10, line 6; page 5, lines 9-15 and lines 25-26). The resistance of the catalyst to attrition is expressed in the application as filed using the Davison Attrition Index. An acceptable attrition resistance is expressed in terms of a Davison Attrition Index equal to or less than 20 (page 11, lines 1-13).

Method by which the catalyst is obtainable

6. The paragraph introducing the detailed description of the invention (page 7, lines 1-6) discloses that the catalyst is prepared from zeolite, alumina, phosphorus and optional additional components. One of the two preferred zeolites is ZSM-5 (page 7, lines 15-16), ZSM-5 being employed in all exemplified compositions. The alumina, which is not meant to include alumina present in the other components of the additive, e.g. ZSM-5 or any clay used to prepare the additive, is referred to "added alumina". It is added to the slurry of starting components and primarily serves to act with phosphorus to form binder for the zeolite (page 7, lines 20-24). The term "phosphorus" as employed in lines 1-6 of page 7 means a phosphorus-containing compound (page 8, lines 17-19) which can be phosphoric acid (page 8, line 18) used in all exemplified embodiments.

6.1 In line with the above cited passage page 7, lines 20-24, claim 11 and the exemplified processes, the paragraph in page 9, lines 11-23 discloses that the catalyst of the invention is generally manufactured by (a) preparing an aqueous slurry comprising a zeolite

having a constraint index of 1 to 12 (which preferably can be ZSM-5 ; see passage cited *supra*, *i.e.* page 7, lines 9-16), phosphorus-containing compound, alumina and optionally, matrix comprising clay, in amounts which will result in a final dried product of step (b) having from 30-85% ZSM-5, no more than 10% by weight added alumina, 6 to 24% by weight phosphorus (as measured P_2O_5) and no more than 30% by weight total alumina; (b) spray drying the slurry of step (a); and (c) recovering a spray-dried product having attrition properties as evidenced by a Davison Index of 20 or less. A calcination step following spray drying is disclosed in independent process claim 11 and in all the examples.

- 6.2 The Respondents objected that the application as filed did not contain any basis for a reaction between alumina and phosphoric acid and therefore also for a binder formed by such reaction. The reaction of phosphoric acid and alumina is, however, well known in inorganic chemistry, *e.g.* in the field of ceramics. Considering that the materials exemplified in the application have been obtained after spray drying and calcination for 2 hours at 537°C (see Examples on page 16, line 20; page 19, line 10; page 20, line 25 and page 22, line 7), the Board has no doubt that the sentence on page 7, lines 23-24 according to which the alumina primarily serves to act with phosphorus to form binder for the zeolite must be understood by the skilled person in the context of the examples of the application as filed and with respect to the embodiments concerning phosphoric acid as the phosphorus-containing compound, as meaning that the

alumina primarily serves to react with phosphoric acid to form binder for the zeolite.

- 6.3 It is undisputed that some of the phosphoric acid may also react with the zeolite and the clay when present. However, the definition of the particulate catalyst as comprising a binder formed by the reaction of the added alumina and phosphoric acid neither excludes that the binder for the zeolite contains additional products of the reaction of the phosphorus with further products such as clay, nor defines that all added alumina and all added phosphoric acid should exclusively react with each other.

Composition of the catalyst

7. The question arises whether the compositional ranges defined in present claim 1 are disclosed in combination with the properties and process features defined in that claim.
- 7.1 According to the summary of the invention (page 5, lines 1-11), it was found that "by limiting the amount of alumina added to the catalyst to 10% or less by weight of the catalyst and further maintaining a phosphorus content between about 6 and 24%, active catalysts containing up to 85% zeolite can be prepared". According to the same passage, "Davison Attrition Indices of 20 or less are achieved by further selecting a phosphorus (as P_2O_5) to total alumina molar ratio sufficient to maintain these attrition indices, while also maintaining acceptable activity, e.g. olefin yields in FCC. Suitable attrition properties are

reflected by particles having Davison index attrition numbers of 20 or lower".

- 7.2 Accordingly, the application as filed discloses two types of catalysts in claim 5 and claim 6 respectively. Claim 5, which refers to claim 2, itself dependent on claim 1 (respectively claim 6, which is dependent on claim 1) concerns a catalyst comprising (a) 60 to 85% (respectively 30 to 60%) by weight zeolite ZSM-5, (b) 6-24% by weight phosphorus, measured as P_2O_5 , and (c) alumina, wherein added alumina is present in an amount ranging from 5 to 10% by weight (respectively in an amount of less than about 10%) and total alumina in an amount of less than 30%, by weight of the catalyst, said catalyst further comprising a molar ratio of phosphorus to total alumina sufficient to obtain a Davison attrition index for the catalyst equal to or less than 20. Thus, the catalysts defined in claims 5 and 6 of the application as originally filed form the basis for defining the two ranges of ZSM-5 concentration defined in present claim 1.
8. In line with the passage in page 5, lines 1-11 (cited above), the passage on page 10, lines 4-5 discloses that the phosphorus/total alumina ratio, wherein the phosphorus is measured as P_2O_5 , is selected to obtain particles that have an attrition index of 20 or less. This ratio is also selected to optimize olefin yield (page 10, line 6). The paragraph on page 10, lines 12 to 21, discloses that ratios for obtaining suitable attrition resistance and preferred activity are dependent upon the content of zeolite. In particular a suitable molar ratio of phosphorus to total alumina is 0,2 to 1,0 when the zeolite content is 30 to 60% by

weight and at least 0,2 to 1,9 when the zeolite content is greater than 60 to 85% by weight. This general statement applies in particular to zeolite ZSM-5 as shown by claims 3 and 7.

9. Concerning the amount of phosphorus contained in the catalyst, the next paragraph (page 10, lines 22-26) indicates that the amount of phosphorus sufficient to obtain hardened particles (*i.e.* in order to resist attrition) which do not exhibit a loss in activity in terms of olefin yield is from 6 to 24% of the total composition or within any range contained within the range of 6-24%, *e.g.* 7-23% or 7-15%. In such circumstances, the range of 7 to 24% as defined in amended claim 1 is according to the established jurisprudence of the Boards of Appeal unequivocally derivable from the original disclosure of the application and thus supported by it (see T 2/81, OJ EPO 1982, 394, point 3). This range applies in particular when phosphoric acid, which is used in all examples, is chosen as the phosphorus-containing compound.

10. It remains to be verified whether the range of the added alumina from 6.5 to 10% by weight of the total weight of the final catalyst when the zeolite content is 30 to 60% by weight is directly and unambiguously disclosed in combination with the other features of the claim, which has been objected by the Respondents.
 - 10.1 Claim 6 of the application as filed discloses by means of its reference to claim 1 the combined use of a concentration of 30 to 60% by weight ZSM-5 zeolite and the use of 10% by weight at most of added alumina.

Respondents' argument that the only range defined for the concentration of added alumina was that defined in claim 8 or in claim 23 of the application as filed, namely 3 to 8% by weight, is therefore not supported by the facts.

- 10.2 Moreover, Examples 1, 3 and 5 concern catalysts obtained according to the method corresponding to the definition provided in amended claim 1, employing 40% by weight zeolite ZSM-5 and added alumina in amounts of 6.5%, 8% and 10% by weight respectively. It is undisputed that Example 1 discloses in particular an amount of added alumina of 6.5% by weight. It should nevertheless be evaluated whether this specific value disclosed only in this example can be considered by the skilled person, on reading of the application as a whole, as a direct and unambiguous disclosure for a lower limit of the amount of added alumina applicable to the preparation of the catalysts as otherwise defined in amended claim 1 when the zeolite content is 30 to 60% by weight.
- 10.3 Claim 8 of the application as filed, which depends on claim 6, itself depending on claim 1, discloses that an amount of added alumina from 3 to 8% by weight can be employed to obtain a catalyst having a Davison Attrition Index equal to or less than 20 while containing from 30 to 60% by weight of ZSM-5 zeolite. The skilled reader of the application as filed would also gather from the Davison Attrition Index values obtained in Examples 1, 3 and 5, using respectively 6.5%, 8% and 10% by weight added alumina, which are well below 20 and decrease when the amount of added alumina increases, that the use of more added alumina,

the function of which is primarily to react with phosphoric acid to form a binder for the zeolite, will not decrease the attrition resistance of the catalyst when the amount of phosphoric acid and the molar ratio of phosphorus to total alumina are kept within the limits defined in present claim 1 (see above points 7 and 8).

10.4 Thus, for catalysts comprising from 30 to 60% by weight of ZSM-5 zeolite, the application as filed not only conveys the teaching of using a minimum amount of added alumina of 3% by weight, but also that any amount above 3%, such as 6.5% by weight as disclosed in Example 1, will also provide a Davison Attrition Index equal to or less than 20, when phosphoric acid is used in the amount defined in present claim 1 and the molar ratio of phosphorus to total alumina is within the range defined therein. Considering that the value of 10% by weight for the amount of added alumina is also originally disclosed as an upper limit of an open range in the context of a catalyst comprising 30 to 60% ZSM-5 zeolite (see above point 7), it can be concluded that the range of 6.5 to 10% by weight of added alumina as defined in amended claim 1 is directly and unambiguously derivable from the original disclosure of the application as filed.

11. Summing up, it follows from the above that the original disclosure provides a direct and unambiguous disclosure for a catalyst defined by the composition, the properties and the method by which it can be obtained as defined in present claim 1. Consequently, amended claim 1 does not extend beyond the content of the application as filed.

12. The Respondents did not object to amended claims 2 to 8. The Board has no reason to take a different view. A restriction in present claim 2 of the Davison Attrition Index to values of 10 or less finds a basis in claim 10 of the application as filed. As the combination of features defining the process of claim 3 is the same as that defined in present claim 1, it follows that claim 3 is also based on the application as filed. The subject-matter of claim 4 concerning the use of the catalysts of the present application in a process for chemically and catalytically reacting a hydrocarbon feed comprising contacting the feed at catalytic reactive conditions with the claimed catalyst is disclosed not only in the passage already cited in above point 5, but also in claim 15. The additional features characterising the process defined in present dependent claims 5 to 7 are disclosed in original claims 25 to 27. A catalyst composition comprising the catalysts of the invention at a concentration of 0.1 to 90% by weight together with a large pore aluminosilicate is disclosed in claim 28 of the application as filed. Hence, claims 2 to 8 also meet the requirements of Article 123(2) EPC.

Article 123(3) EPC

13. Article 123(3) EPC precludes amending the claims during opposition proceedings in such a way as to extend the protection conferred by the patent as granted. The protection conferred by the patent as granted is, according to the established jurisprudence of the Boards of Appeal (see in particular G 1/93, *supra*, point 11 of the reasons), assessed taking into account

the provisions of Article 69(1) EPC and the protocol on its interpretation, although said provisions are primarily intended to be applied by the Courts responsible for deciding on infringement cases (cf. G 1/98, OJ EPO 2000, 111, point 4 of the reasons).

13.1 Article 69(1) EPC stipulates that the extent of the protection conferred by a European patent or a European patent application shall be determined by the claims. Nevertheless, the description and drawings shall be used to interpret the claims. According to Article 1 of the Protocol on the Interpretation of Article 69, Article 69 should not be interpreted as meaning that the extent of the protection conferred by a European patent is to be understood as that defined by the strict, literal meaning of the wording used in the claims, the description and drawings being employed only for the purpose of resolving an ambiguity found in the claims. Nor should it be taken to mean that the claims serve only as a guideline and that the actual protection conferred may extend to what, from a consideration of the description and drawings by a person skilled in the art, the patent proprietor has contemplated. On the contrary, it is to be interpreted as defining a position between these extremes which combines a fair protection for the patent proprietor with a reasonable degree of legal certainty for third parties.

13.2 Claim 1 as granted referred to "...a binder system comprised of the reaction product of greater than 7 to 24% by weight of elemental phosphorus, measured as P₂O₅, based on the weight of the catalyst, and added alumina in an amount ranging from 5 to 10% by weight of the

catalyst..". This claim did not require the presence of elemental phosphorus, but only quantified the amount of the element phosphorus, expressed in terms of P_2O_5 , present in the phosphorus compound reacting with added alumina to form the binder, and the Board considers this is also how a skilled person in this art would interpret the claim. The reference to elemental phosphorus is for calculation purposes, and not to indicate that actual elemental phosphorus was used as starting compound for obtaining the binder. Any doubts a reader might have had that this is the correct interpretation of the claim would be removed by reading the description.

14. The description of the patent specifies in paragraph [0020] that the catalysts of the invention are prepared from zeolite, alumina, phosphorus and optional additional components, said four categories of compounds being more specifically defined in subsequent paragraphs [0021] to [0028]. Paragraph [0029] of the patent describes the preparation method by which the catalyst of the invention are generally manufactured, namely from a slurry of the components mentioned above, *i.e.* from the compounds defined in paragraphs [0021] to [0028]. According to paragraph [0029] of the patent and to all exemplified preparation of catalysts (paragraphs [0052], [0057], [0061], [0065], [0074], [0078], [0081]), the synthesis of the catalyst comprises the preparation of an aqueous slurry comprising the zeolite, phosphorus-containing compound, alumina and optionally clay, in amounts which will result in a final dried product having after spray drying from 30-85% ZSM-5 or ZSM-11, 5-10% by weight added alumina, 7-24% by weight phosphorus (measured as P_2O_5) and no more than 30% by

- weight total alumina. According to paragraph [0023] which describes the alumina employed to prepare the catalysts of the invention, the expression "added alumina" used in claim 1 of the patent as granted is defined as alumina separately added to the slurry of starting compounds. It is described to primarily serve to act with phosphorus to form binder for the zeolite.
15. As regard the phosphorus-containing compound, phosphoric acid is employed in the preparation of all exemplified catalysts and is the first compound mentioned in paragraph [0026] confirming the preference for this compound. Moreover, with the exception of claim 1 there is no mention in the patent as granted of the use of elemental phosphorus. Thus, the reader can be certain that the reference in claim 1 to "elemental phosphorus" is merely for the purpose of calculating the quantity of phosphorus considered as P_2O_5 , and is not an indication that elemental phosphorus was actually used. Thus, the definition in claim 1 now put forward that the catalyst can be prepared using phosphoric acid does not extend the protection conferred by the patent.
16. The argument of the Respondents that claim 1 as granted did not cover the use of phosphoric acid, but only of elemental phosphorus, is supported neither by the wording of claim 1 nor by the description. Any doubts which a skilled person in the art might have had as to this, would be removed by referring to the description.
17. In the context of the present claims, the infinitesimal difference between greater than 7% as defined in granted claim 1 and 7% as defined now in claim 1,

although it has a mathematical meaning, cannot be experimentally measured in view of the margin of uncertainty inherently attached to the measurement of such amounts. It thus follows that for the skilled person in the field of catalysts to whom the patent in suit is addressed, a lower amount of greater than 7% and a lower amount of 7% are indistinguishable. Thus, although there might be cases where a difference might be seen between two lower limits defined in this way, in the present case the Board considers the two definitions equivalent, so that the definition of an amount of 7% by weight for the minimum amount of phosphorus (measured as P_2O_5) in the final catalyst also does not extend the scope of protection. Decision T 592/99 (*supra*) cited by the Respondents concerned an amendment to the claimed subject-matter leading to different products (see point 2.4 of the reasons) and is therefore not relevant to the present case.

18. Thus, in these circumstances, the Board concludes that that the protection conferred by the patent as granted has not been extended by the claims now put forward.

19. The patent was revoked by the Opposition Division on the sole ground that present claim 1 lacked a proper basis in the application as filed contrary to the requirements of Article 123(2) EPC. Although novelty has not been contested, the issue of inventive step has yet to be examined and decided on. The Board accordingly deems it appropriate, exercising its discretion under Article 111(1) EPC, to remit the case to the department of first instance for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The matter is remitted to the first instance for further prosecution on the basis of the claims of the main request submitted at the oral proceedings on 8 January 2010.

The Registrar

The Chairman

S. Fabiani

S. Perryman