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**Datasheet for the decision  
of 4 October 2011**

**Case Number:** T 0302/07 - 3.3.07  
**Application Number:** 98307583.9  
**Publication Number:** 903178  
**IPC:** B01J 29/40, C10G 11/05  
**Language of the proceedings:** EN

**Title of invention:**

A pentasil-type molecular sieve containing composition, its preparation method and use

**Patent Proprietors:**

CHINA PETRO-CHEMICAL CORPORATION  
RESEARCH INSTITUTE OF PETROLEUM PROCESSING, SINOPEC

**Opponent:**

Akzo Novel N.V:

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56, 114(2)  
EPC R. 103(1)(a)

**Relevant legal provisions (EPC 1973):**

-

**Keyword:**

G 0007/93

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0302/07 - 3.3.07

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.07  
of 4 October 2011

**Appellants:**  
(Opponents)

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**Decision under appeal:**

**Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
22 December 2006 concerning maintenance of  
European patent No. 903178 in amended form.**

**Composition of the Board:**

**Chairman:** J. Riolo  
**Members:** D. Semino  
M.-B. Tardo-Dino

## Summary of Facts and Submissions

- I. The appeal of the opponents lies against the decision of the Opposition Division to maintain European patent No. 0 903 178 in amended form announced on 28 November 2006. The granted patent had been published on 26 November 2003, comprised 12 claims and included independent product claim 1, independent claim 6 directed to a method of preparation of the product of claim 1 and independent use claim 12 concerning use of the product of claim 1. Claim 1 as granted read as follows:
- "1. A pentasil-type molecular sieve containing composition which comprises from 85 to 98%wt pentasil-type zeolite which has a  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio from 15 to 60; from 1 to 10%wt phosphorus (based on  $\text{P}_2\text{O}_5$ ); from 0.3 to 5%wt Mg or Ca (based on its oxide); and from 0.3 to 5%wt Ni, Cu or Zn (based on its oxide)."
- II. A notice of opposition was filed against the granted patent requesting revocation of the patent in its entirety on the grounds of lack of novelty and lack of inventive step in accordance with Article 100(a) EPC. Oral proceedings were held before the Opposition Division on 28 November 2006. A final date for making written submissions and/or amendments according to Rule 71a EPC 1973 (now Rule 116 EPC) had been set on 27 October 2006.
- III. The decision of the opposition division was based on the claims as granted as main request and on three auxiliary requests. The third auxiliary request still included independent product claim 1, independent claim

6 directed to a method of preparation of the product of claim 1 and independent use claim 12 concerning use of the product of claim 1, wherein claim 1 read as follows:

"1. A pentasil-type molecular sieve containing composition which comprises from 85 to 98%wt pentasil-type zeolite which has a  $\text{SiO}_2/\text{Al}_2\text{O}_3$  molar ratio from 15 to 60; from 1 to 10%wt phosphorus (based on  $\text{P}_2\text{O}_5$ ); from 0.3 to 5%wt alkaline earth metal (based on its oxide); and from 0.3 to 5%wt transition metal (based on its oxide); wherein the alkaline earth metal is selected from Mg or Ca and the transition metal is selected from Ni or Zn."

In the decision documents (1) (JP-A-6 226 105) and (2) (JP-A-7 144 135) filed with the notice of opposition and document (8) (US-A-4 137 195) filed during oral proceedings before the Opposition Division at the start of the discussion on novelty of the third auxiliary request (see minutes, point 5c) were cited *inter alia*.

IV. According to the decision under appeal the amended claims according to the third auxiliary request met the requirements of Articles 123(2), 84, 54 and 56 EPC. As to inventive step, the Opposition Division held that, while the patent in suit concerned catalysts used in catalytic cracking or pyrolysis processes, document (1) and document (2) related to the removal of  $\text{NO}_x$  from exhaust gases, so that the skilled person would not consult those documents in order to solve any specific problem related to catalytic cracking, such as the increase in ethylene yield.

The late-filed document (8) was disregarded by the Opposition Division since it was not *prima facie* relevant and it was not introduced in response to any new fact. As to the relevance, the Opposition Division found that document (8) did not *prima facie* take away novelty of the claimed subject-matter, since the opponents based their objection on a combination of several passages, requiring multiple selection to be made as well as some estimation of the ion exchange capacity. Moreover, document (8) did not relate to cracking catalysts.

- V. The opponents (appellants) appealed that decision. With the statement setting out the grounds of appeal they filed as Annex I some calculations aimed at computing the maximum amount of nickel oxide and zinc oxide in the zeolites of document (8). They further requested the reimbursement of the appeal fee and the remittal to the first instance because of a substantial procedural violation.
- VI. In the reply to that statement the patent proprietors (respondents) requested *inter alia* that document (8) not be admitted into the proceedings.
- VII. In a communication sent in preparation to the oral proceedings the Board addressed *inter alia* the issue of inventive step, illustrated the general principles used in the identification of the closest prior art ("The closest prior art for the purpose of assessing inventive step is generally that which corresponds to a purpose or technical effect similar to that of the invention and requiring the minimum of structural and functional modifications", point 4.1 in that

communication) and expressed doubts regarding the choice of any of documents (1), (2) and (8) as closest prior art (neither document (8), nor documents (1) and (2) "relate to catalysts for catalytic cracking reactions, so that it is not only questionable which could be the most reasonable starting point, but also whether with such a remote starting point it could be possible to arrive at the claimed catalyst", also in point 4.1 of the communication).

- VIII. In their letter of 2 September 2011 the appellants mentioned several documents not previously introduced into the proceedings without providing any copy thereof.
- IX. By letter of 3 October 2011 the respondents filed two further sets of claims as first and second auxiliary request.
- X. Oral proceedings took place on 4 October 2011 in the announced absence of the appellant.
- XI. The arguments of the appellants can be summarised as follows:

*Substantial procedural violation*

- (a) Document (8) was *prima facie* relevant, since it disclosed all features of claim 1 according to the request maintained by the Opposition Division explicitly or as a result of some simple and logical calculations. Since claims 1 to 11 according to that request did not include any limitation to catalytic cracking, the lack of reference to that feature in document (8) was

irrelevant. Moreover, document (8) was submitted in response to a request filed on the last day of the period for submitting written submissions prior to the oral proceedings, so that the opponents did not have an earlier opportunity to respond with additional prior art to such an amendment. In addition, document (8) was cited during examination proceedings and was cited in the patent in suit as granted. For those reasons, the Opposition Division committed a substantial procedural violation in disregarding document (8). The document should therefore be admitted and the case should be referred back to the Opposition Division.

*Novelty*

- (b) Document (8) disclosed in claim 1, combined with the parts of the description providing the preferred ranges for the silica to alumina ratio, for the quantity of phosphorus oxide and for the quantity of magnesium oxide, and concerning the replacement of alkali metal in the zeolite with nickel and zinc, all features of the composition of claim 1 according to the request maintained by the Opposition Division in combination, which therefore lacked novelty. As to the quantity of nickel and zinc oxide, the computation of their amount in case of total replacement of the original alkali metal with nickel and zinc led to values which belonged to the ranges according to claim 1. Those computation were available in Annex I attached to the statement of grounds.

*Inventive step*

- (c) The composition of claim 1 according to the request maintained by the Opposition Division was not limited to the function it must perform. Moreover, the purpose of the patent in suit was the provision of a composition which has better thermal and hydrothermal stability in comparison with the catalytic material of the prior art and "can or might" be used in catalytic cracking or catalytic pyrolysis, but is not necessarily so used. Therefore, the disclosures of documents (1) and (2), which were directed to molecular sieves with high activity across a wide temperature range and no deterioration in activity when used at high temperatures in the presence of water vapour, were realistic starting points for the claimed composition, even if they did not concern catalytic cracking, but dealt with the removal of NO<sub>x</sub> from exhaust streams. The subject-matter of the patent in suit differed from the working example 5 of document (1) only in the provision of nickel or zinc in place of copper as the transition metal. Since the patent in suit indicated the equivalence of the three transition metals, as confirmed in its examples, the technical problem to be solved had to be re-formulated as the provision of an alternative, thermally stable composition which contained a pentasil-type molecular sieve. The patent literature concerned with removal of NO<sub>x</sub> from exhaust gases generally considered nickel and zinc as candidates for ion-exchange of ZSM-5 zeolites. In view of that, the skilled person would consider that replacement as an obvious



variant and would arrive at the claimed composition without the exercise of an inventive skill.

- (d) For similar reasons, document (8), which related to a thermo-chemical decomposition of toluene into benzene by means of a molecular sieve catalyst with high thermal tolerance, could be considered as a reasonable starting point for the analysis of inventive step. That document failed only to explicitly recite the presence of zinc and nickel transition metals. However, it suggested that the zeolites could be combined with matrix materials, including in particular inorganic metal oxides in an amount of 1 to 99%wt by weight of the composite. Document (8) itself mentioned *inter alia* nickel and zinc oxides, which moreover were known for that purpose in the patent literature in the field, so that the skilled person would consider combining the explicitly disclosed catalyst of document (8) with nickel or zinc oxides in amounts overlapping with the amounts claimed.

No objection on lack of inventive step based on a closest prior art related to catalysts for catalytic cracking or pyrolysis of hydrocarbons was raised by the appellants.

XIII. The arguments of the respondents can be summarised as follows:

*Substantial procedural violation*

(a) Document (8) was filed only in the middle of the oral proceedings before the Opposition Division, which took place more than two years after the original notice of opposition. Document (8) was not *prima facie* relevant, as shown by the opponents' objection, which was based on a combination of several passages, requiring multiple selections to be made as well as some estimation of the ion exchange capacity. Moreover, it did not relate to cracking catalysts. In addition, it was not introduced in response to any new fact because the use of nickel and zinc as transition metal was already described in the claims as granted. For those reasons, the Opposition Division rightly exercised its discretion not to admit the late-filed document and committed no substantial procedural violation.

*Novelty*

(b) Document (8) was not novelty destroying, since it did not disclose that the amount of zeolite in the catalyst is from 85 to 98%wt, that the composition should contain a transition metal in an amount from 0.3 to 5%wt and that the composition should contain a transition metal selected from nickel or zinc in preference to other transition metals. Nickel and zinc were disclosed as part of a list of metal ions that might be exchanged with the

alkali metal of the zeolite, but were in no way preferred. Moreover, the opponents' calculation of the quantity of nickel and zinc oxide in Annex I attached to the statement of grounds were not realistic because they were based on incorrect assumptions and did not correctly reflect the inherent disclosure of document (8). In particular, the calculations were based on a chemical formula for the alkali metal form of the zeolite, which was nowhere disclosed in document (8) and on the assumption of a complete exchange of the alkali metal with nickel or zinc, which was not feasible. For those reasons, document (8) did not inherently disclose a composition as claimed.

*Inventive step*

- (c) The invention in the patent in suit was based on the unexpected finding that compositions containing a pentasil-type zeolite activated by phosphorus, magnesium or calcium and nickel or zinc could be applied in the catalytic cracking or pyrolysis of hydrocarbons in order to produce an enhanced yield of ethylene and propylene. The cited documents (1), (2) and (8) related to a quite different art, namely removal of NO<sub>x</sub> from engine exhaust gases (documents (1) and (2)) and disproportionation of toluene to produce benzene and xylenes rich in the para-isomer (document (8)) and were therefore not appropriate as a starting point for the analysis of inventive step. The skilled person with the whole possible prior art at his disposal would indeed not start from any of those documents, but from a catalyst used in

catalytic cracking or pyrolysis of hydrocarbons. A reasonable starting point would then be the prior art acknowledged in the patent, such as the catalyst of comparative example 2. Since there was no hint in the available prior art that nickel or zinc should be incorporated in a zeolite catalyst containing phosphorus and magnesium in order to increase the yield of ethylene and propylene in catalytic cracking or pyrolysis of hydrocarbons, the claimed catalyst involved an inventive step over the cited prior art.

XIII. The appellants (opponents) requested in their written submissions that the decision under appeal be set aside, that document (8) be admitted to the proceedings, that the appeal fee be refunded for a substantial procedural violation, that the case be referred back to the Opposition Division for consideration of the validity of the amended claims in light of document (8) and, as an auxiliary request, that the patent be revoked.

XIV. The respondents (patent proprietors) requested that the appeal be dismissed or, alternatively, that the patent be maintained on the basis of one of the sets of claims of the first or second auxiliary request as submitted by letter of 3 October 2011. They no longer objected to the introduction of document (8) into the proceedings.

## Reasons for the Decision

1. The appeal is admissible.
  
2. *Substantial procedural violation*
  - 2.1 The basic principle here applicable was set out by the Enlarged Board in G 7/93 (OJ EPO 1994, 775): "If a first instance department is required under the EPC to exercise its discretion in certain circumstances, such a department should have a certain degree of freedom when exercising that discretion, without interference from the Boards of Appeal" (point 2.6 of the reasons).
  
  - 2.2 Document (8) was filed by the appellants at the start of the discussion on the third auxiliary request during the oral proceedings before the Opposition Division, which were held around three years after the publication of the patent in dispute. The filing of document (8) therefore took place not only well after the nine months period for filing the notice, but also after the final date set by the Opposition Division according to Rule 116 EPC (then Rule 71a EPC 1973), so that there can be no doubt that the document was late filed.
  
  - 2.3 The main amendment in claim 1 according to the third auxiliary request with respect to granted claim 1 consisted in the limitation of the transition metal to nickel or zinc instead of nickel, copper or zinc. Such a limitation to two of the three possible alternatives included in the granted patent cannot be considered as a change in the subject of the proceedings which may justify a late filing from the appellants.

- 2.4 Moreover, neither the fact that document (8) had been mentioned in a communication of the Examining Division during examination proceedings, nor that it was cited in the granted patent (among many other documents, see paragraph [0005]) implies that the document was automatically part of the opposition proceedings (see Case Law of the Boards of Appeal of the EPO, 6th edition, 2010, VII.C.1.7).
- 2.5 According to Article 114(2) EPC, the "European Patent Office may disregard facts and evidence which are not submitted in due time by the parties concerned". The Opposition Division decided to exercise its discretion in disregarding the document and provided substantial reasons for doing so in the decision under appeal (see point 5.3 in the grounds of the decision as summarised under point IV above).
- 2.6 The Board given the circumstances set out in paragraphs 2.1 to 2.4 and the reasons given by the opposition division in its decision does not see how this exercise of discretion could be considered as wrongful, i.e. not making use of the right principles governing the late filed documents or exercised in an unreasonable way.
- 2.7 For these reasons, the Board comes to the conclusion that no substantial procedural violation took place in disregarding document (8) during opposition proceedings. A remittal on this basis is therefore out of question.

3. *Novelty over document (8)*

3.1 Document (8) was filed again by the appellants with the statement setting out the grounds of appeal and was the basis of all objections raised in that statement related to lack of novelty and lack of inventive step against all claims according to the request maintained by the Opposition Division.

3.2 With that statement the appellants additionally filed Annex I, which contained some computations of the maximum amount of nickel oxide and zinc oxide in the zeolites of document (8). That Annex was meant to support the relevance of document (8) and to fill in some of the gaps which had been noted by the Opposition Division in the decision under appeal and had led to the decision to disregard the document.

3.3 This new factual situation regarding document (8) threw another light on the document which modified the basis on which the Board should in its turn exercise its discretion. Moreover, the respondents no longer objected to the admissibility of document (8) into the proceedings. Therefore, given the evolution of the factual framework during the appeal proceedings, the Board finds it appropriate to admit document (8) into the appeal proceedings and decide on novelty and inventive step on the basis of the objections on file.

3.4 Document (8) discloses a catalyst comprising a crystalline aluminosilicate zeolite having a silica to alumina ratio of at least about 12 and a constraint index within the approximate range of 1 to 12, said catalyst having been modified by initial treatment with

an ammonium phosphate followed by treatment with a magnesium compound to yield a composite containing phosphorus oxide and magnesium oxide, each in an amount of at least about 0.25 percent by weight (claim 1).

- 3.5 The silica to alumina ratio in the catalyst is preferably at least 30 (column 2, lines 50-52); the amount of phosphorus oxide is preferably at least 2% by weight (column 9, lines 5-7); the amount of magnesium oxide is preferably at least 1% by weight (column 10, lines 8-10).
- 3.6 When synthesized in the alkali metal form, the zeolite is conveniently converted to the hydrogen form. In addition to the hydrogen form, other forms of the zeolite wherein the original alkali metal has been reduced to less than about 1.5 percent by weight may be used. Thus, the original alkali metal of the zeolite may be replaced by ion exchange with other suitable ions of Groups IB to VIII of the Periodic Table including, by way of example, nickel, zinc, calcium or rare earth metals (column 8, lines 24-36).
- 3.7 In the absence of explicit values for the amount of nickel or zinc which is present in the zeolite after replacement of the alkali metal, the appellants have provided calculations in Annex I which result in some weight percentage of nickel oxide and zinc oxide in the zeolite.
- 3.7.1 The computations in Annex I assume a silica to alumina molar ratio of 30 (weight of zeolite equal to 30 times the molecular weight of silica plus one times the molecular weight of alumina, third paragraph in the



Annex) and an alkali oxide to alumina molar ratio of 1 ("a single cation site is associated with each Al present in the zeolite", 6th paragraph), i.e. a chemical formula of the zeolite  $M_2O:Al_2O_3:30SiO_2$ . In addition, they assume total replacement of the alkali metal with nickel or zinc ("Each nickel ion will occupy two cation sites in the zeolite", 8th paragraph, and analogous passage for zinc in the 12th paragraph).

3.7.2 Neither of those assumptions is based on the disclosure in document (8). In that document it is not specified in which kind of zeolite the alkali metal is replaced by nickel or zinc, so that the initial quantity of alkali is not available. In addition, it is not clear whether a partial or total replacement takes place (actually the cited passage mentioning reduction of the alkali metal to less than 1.5 percent by weight in column 8, lines 29-31 seems to indicate only a partial replacement until that condition is met), so that also the final quantity of alkali metal is undefined. Moreover, modification of the zeolite with ammonium phosphate and a magnesium compound takes place on the zeolite after replacement of the alkali metal (column 8, lines 37-42; column 9, lines 35-37), which leaves a further degree of uncertainty on the amount of nickel or zinc oxide, since they can be displaced by the phosphorus and the magnesium.

3.8 Under such circumstances the calculations of the quantity of nickel and zinc in the zeolite in Annex I are only the result of speculations, which are not based on the disclosure, be it explicit or implicit, of document (8).

3.9 The composition of claim 1 according to the request maintained by the Opposition Division differs from the disclosure of document (8) at least in that it contains a quantity of 0.3 to 5%wt transition metal, which is selected from nickel or zinc, while no quantity is disclosed in that document. The claimed composition is therefore novel with respect to the disclosure in document (8).

4. *Inventive step*

4.1 It is a generally accepted principle in the case law of the boards (Case Law, *supra*, I.D.3.1-3.2) that the closest prior art for the purpose of assessing inventive step is a piece of prior art disclosing subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications. In accordance with this principle a document cannot qualify as the closest prior art to an invention merely because of similarity in the composition of the products; its suitability for the desired use of the invention also has to be described.

4.2 The patent in suit relates to "a pentasil-type molecular sieve containing composition which can be applied in catalytic cracking reaction for producing more ethylene and propylene, and its preparation method" (paragraph [0001]). Its object is "to provide a pentasil-type molecular sieve containing composition which can be applied in catalytic cracking reaction for producing more ethylene and propylene, and which has better thermal and hydrothermal stability, and can

increase the ethylene yield further when being used in catalytic pyrolysis process, in comparison with the catalytic materials of the prior art" (paragraph [0010]).

4.3 The appellants supported the view that the verb "can" in the expressions "can be applied" and "can increase" should be read as "might", therefore referring to an optional use of the product and not to a necessary property of the same. The Board cannot accept this view. In patent language a product which "can be applied" in a certain use is a product which "is suitable" for that use. Moreover, the specification of such a use both in the field and in the object of the invention together with the indication of the properties related to such use which should be improved is exactly the definition of the purpose or objective of the invention which is crucial in the selection of the closest prior art.

4.4 Document (1) relates to an exhaust gas cleaning catalyst for an internal combustion engine which can efficiently remove NO<sub>x</sub> even in a low temperature range and is only slightly deteriorated if used at high temperature for a long time (paragraph [0001] of the translation into English). Document (2) relates to a method for producing a catalyst used for cleaning the exhaust gas emitted from an internal combustion engine, having excellent low-temperature activity and heat resistance (paragraph [0001] of the translation into English). Document (8) relates to a process for disproportionation of toluene to yield benzene and xylenes in which the proportion of para-xylene isomer is substantially in excess of its normal equilibrium concentration (column 1, lines 15-20). No other uses of

the described catalysts are disclosed in those documents.

- 4.5 Independently of the similarity of the disclosed products, documents (1), (2) and (8), which do not concern catalysts for catalytic cracking and pyrolysis processes, are therefore not suitable as closest prior art in view of the criterion illustrated above (point 4.1).
- 4.6 In spite of the presentation of this issue in the communication of the Board sent in preparation to the oral proceedings (point VII above), the appellants decided not to present any objection on lack of inventive step based on a piece of prior art related to catalysts for catalytic cracking or pyrolysis of hydrocarbons and not to appear at the oral proceedings.
- 4.7 In such a situation, in the assessment of inventive step the Board can only consider as the closest prior art the one described in the patent in suit as the starting point for the invention.
- 4.8 Comparative example 2 is presented in the patent in suit (paragraphs [0038]-[0040]) as illustrating "the effects of the ZSM-5 modified by P and Mg elements of the prior art". The respondents did not contest that that composition was known in the field of application of the patent in suit and was the starting point of their invention. It is therefore considered as the closest prior art.
- 4.9 Comparative example 2 discloses a molecular sieve identified as ZSM-5B (paragraph [0039]), which is a

ZSM-5 zeolite with a silica to alumina molar ratio of 25.0 and a Na<sub>2</sub>O content of 0.10%wt after NH<sub>4</sub><sup>+</sup> exchange (paragraph [0029]), wherein ZSM-5 zeolite is a pentasil-type molecular sieve (paragraph [0013]). The composition of comparative example 2 contains in addition to the ZSM-5 zeolite 5.0%wt phosphorus oxide and 1.4%wt magnesium oxide (paragraph [0039]).

- 4.10 The composition of claim 1 according to the request maintained by the Opposition Division differs from the one of comparative example 2 in that it further contains from 0.3 to 5%wt transition metal (based on its oxide), wherein the transition metal is selected from nickel or zinc.
- 4.11 The problem to be solved according to the patent in suit is "to provide a pentasil-type molecular sieve containing composition which can be applied in catalytic cracking reaction for producing more ethylene and propylene, and which has better thermal and hydrothermal stability, and can increase the ethylene yield further when being used in catalytic pyrolysis process, in comparison with the catalytic materials of the prior art" (paragraph [0010]).
- 4.12 Table 2 in the patent in suit compares the hydrothermal stability of the composition according to comparative example 2 with the one of compositions falling under claim 1 according to the request maintained by the Opposition Division (compositions according to examples 1 and 2 containing nickel and according to examples 3 and 4 containing zinc, paragraphs [0044]-[0051]). In order to do so the compositions were firstly aged under high temperature hydrothermal

conditions to obtain sample D-2 (from comparative example 2, paragraph [0040]), sample ZEP-11 (from example 1, paragraph [0045]), sample ZEP-12 (from example 2, paragraph [0047]), sample ZEP-13 (from example 3, paragraph [0049]) and sample ZEP-14 (from example 4, paragraph [0051]). Thereafter micro-pulse reaction evaluation was performed and conversion of  $nC_{14}$  in the presence of the different catalysts was evaluated. The results of table 2 show that, while some catalysts according to the invention allow somewhat higher conversion (ZEP-11, ZEP-12 and ZEP-13 with conversions of 99.6%, 98.6% and 99.3%) than the one of the catalyst according to comparative example 2 (D-2 with a conversion of 98.0), in one case (ZEP-14 with a conversion of 97.5%) the conversion is slightly lower than for the comparative example.

- 4.13 In example 7 (paragraphs [0056]-[0059]) the yield in ethylene in catalytic cracking (Table 3) and catalytic pyrolysis (Table 4) of hydrocarbons (a light diesel fuel fraction and a VGO fraction, respectively) in the presence of catalysts D-2, ZEP-11 and ZEP-13 are compared. The yield in ethylene for ZEP-11 and ZEP-13 (3.51wt% and 3.46wt% respectively) is higher than the one for D-2 (2.88wt%) in case of catalytic cracking of a light diesel fuel fraction. Also in the case of catalytic pyrolysis of a VGO fraction the yield in ethylene for ZEP-11 and ZEP-13 (23.20wt% and 23.95wt% respectively) is higher than the one for D-2 (20.77wt%).
- 4.14 In view of those comparative tests, it can be concluded that, while the improvement in ethylene yield for the catalysts of the invention with respect to the one of the prior art has been shown both for catalytic

cracking and for catalytic pyrolysis, the hydrothermal stability is comparable for the two catalysts.

- 4.15 The technical problem effectively solved by the composition of claim 1 according to the request maintained by the Opposition Division with respect to the closest prior art represented by comparative example 2 is therefore to provide a pentasil-type molecular sieve containing composition which can be applied in catalytic cracking reactions for producing more ethylene, and which has comparably good hydrothermal stability, and can increase the ethylene yield when used in catalytic pyrolysis processes.
- 4.16 It remains to be determined whether the skilled person starting from the composition of comparative example 2 and looking for a solution to the posed problem would arrive in an obvious manner at the claimed composition.
- 4.17 As previously analysed (point 4.4 above) the prior art cited and filed by the appellants (documents (1), (2) and (8)) does not relate to the field of catalytic cracking and catalytic pyrolysis, so that it cannot provide any hint to the skilled person looking for a solution to the posed problem. As to the many additional documents which have been mentioned by the appellants for the first time in their letter of 2 September 2011, none of them can be considered as introduced into the proceedings by the appellants, since they did not file a copy of those documents. Therefore, those documents need not be considered by the Board. In any case, it was clear from the comments of the appellants in their letter of 2 September 2011

that also those documents were not related to the field of catalytic cracking and catalytic pyrolysis.

4.18 For these reasons, the composition of claim 1 according to the request maintained by the Opposition Division involves an inventive step, having regard to the cited prior art.

4.19 No different conclusion could be obtained starting from a more remote piece of prior art, such as any of documents (1), (2) and (8), which is unrelated to the specific use, which is central in the patent. The formulation of a technical problem addressing the improvement of ethylene yield in catalytic cracking and pyrolysis of hydrocarbons, when starting from a document which is not concerned with that kind of processes, would in itself be the result of an *ex-post facto* analysis. Moreover, the lack of a hint in the cited prior art that, in order to achieve that objective, a zeolite with phosphorus, magnesium or calcium and nickel or zinc should be used, would anyway lead to the acknowledgement of the presence of an inventive step.

5. The method of preparation of the product of claim 1 according to claim 6 and the use of the product of claim 1 in the catalytic cracking of hydrocarbons according to claim 12, against which no separate objections of lack of novelty and/or lack of inventive step were raised by the appellants, are also allowable for the same reasons as detailed for the product of claim 1 *mutatis mutandis*.



6. *Request for reimbursement of the appeal fee*

6.1 The request for reimbursement of the appeal fee filed by the appellants according to Rule 103(1)(a) EPC is not allowable because neither the prerequisite, namely that the Board deems the appeal to be allowable, nor the requirement of a substantial procedural violation (see point 2 above) are met.

**Order**

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

The appeal is dismissed.

The Registrar

The Chairman

S. Fabiani

J. Riolo