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D E C I S I O N
of 20 October 2004

Case Number: T 0426/00 - 3.2.4

Application Number: 94117307.2

Publication Number: 0638710

IPC: F01N 3/20

Language of the proceedings: EN

Title of invention:

Adsorbent for purification of automobile exhaust gas and
method of controlling emission of unburnt hydrocarbons from
internal combustion engine

Patentee:

NGK INSULATORS, LTD.

Opponent:

Emitec Gesellschaft für Emissionstechnologie mbH

Headword:

-

Relevant legal provisions:

EPC Art. 54(3), (4); 100(a), (b); 123(2)

Keyword:

"Sufficiency of disclosure (yes)"
"Added subject-matter (disclaimer) (no)"
"Novelty and inventive step (yes)"

Decisions cited:

G 0001/03; G 0002/03; G 0001/92; G 0009/91; T 0898/91;
T 0529/99

Catchword:

-



Case Number: T 0426/00 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 20 October 2004

Appellant I:
(Opponent)

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Appellant II:
(Proprietor of the patent)

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Decision under appeal:

Interlocutory decision of the Opposition
Division of the European Patent Office posted
8 February 2000 concerning maintenance of
European patent No. 0638710 in amended form.

Composition of the Board:

Chairman: M. Ceyte
Members: C. Scheibling
M. Aúz Castro

Summary of Facts and Submissions

I. Against the decision of the opposition division of 8 February 2000 to maintain the patent in amended form on the basis of an auxiliary request both, the opponent (appellant I) and the patentee (appellant II) filed an appeal.

In the oral proceedings of 27 June 2003 the subject matter of appellant's II main request was held to lack novelty.

Claim 1 of the auxiliary request contained a disclaimer. In view of the questions concerning the admissibility of disclaimers pending before the Enlarged Board of Appeal in cases G 1/03 and G 2/03, the Board by its interlocutory decision set aside the decision under appeal, rejected the main request of Appellant II (patentee) and suspended the proceedings either until the Enlarged Board of Appeal had taken a decision in cases G 1/03 and G 2/03 or until auxiliary requests without disclaimer were presented by Appellant II.

II. The Enlarged Board of Appeal took a decision in cases G 1/03 and G 2/03 on 8 April 2004.

III. Oral proceedings before the Board took place on 20 October 2004. In these proceedings Appellant II filed a single request comprising the following set of independent claims. All other requests still on file were withdrawn.

Claim 1 for the designated states BE, ES, IT and SE reads as follows:

"1. An adsorbent structure comprising:
a honeycomb structure having a periphery and two ends,
including a plurality of passages which are defined by
partition walls and extend in an axial direction
between the ends; and
an adsorbent for purification of automobile exhaust gas
coated on the partition walls and comprising a zeolite
characterised in that the zeolite is a high-silica
zeolite having a Si/Al ratio of not less than 48 and is
either an H (proton) type zeolite or a zeolite obtained
by subjecting an H (proton) type zeolite to ion
exchange with at least one noble metal selected from
Pt, Pd, Rh, Ir and Ru."

Claim 1 for the designated states DE, FR and GB reads
as follows:

"1. An adsorbent structure comprising:
a honeycomb structure having a periphery and two ends,
including a plurality of passages which are defined by
partition walls and extend in an axial direction
between the ends; and
an adsorbent for purification of automobile exhaust gas
coated on the partition walls and comprising a zeolite
characterised in that the zeolite is a high-silica
zeolite having a Si/Al ratio of not less than 48 and is
an H (proton) type zeolite, excluding such a zeolite
obtained by mixing the zeolite with silica sol, drying
and calcining, or a zeolite obtained by subjecting an H
(proton) type zeolite to ion exchange with at least one
noble metal selected from Pt, Pd, Rh, Ir and Ru, the
percent ion exchange of the noble metal being 30 to
85%."

Claim 3 for the designated states BE, ES, IT and SE as well as for the designated states DE, FR and GB reads as follows:

"3. Method of controlling emission of unburnt hydrocarbons from an internal combustion engine at start-up, comprising the steps of:

- (1) providing a catalyst for hydrocarbon conversion and an adsorbent capable of adsorbing hydrocarbons when cold, said adsorbent comprising zeolite which has a Si/Al ratio of at least 48 and is an H (proton) type zeolite or a zeolite obtained by subjecting an H (proton) type zeolite to ion exchange with at least one noble metal selected from Pt, Pd, Rh, Ir and Ru, said catalyst and said adsorbent being carried together on a support or carried on respective supports with the catalyst downstream in the exhaust gas flow from the engine relative to the adsorbent,
- (2) starting the engine when cold, with the adsorbent and the catalyst in a cold state, and
- (3) starting the engine, heating said catalyst electrically, whereby unburnt hydrocarbons are first adsorbed from the cold exhaust gas by said adsorbent and thereafter desorbed from the adsorbent and reacted by said electrically heated catalyst."

Claim 5 for the designated states BE, ES, IT and SE as well as for the designated states DE, FR and GB reads as follows:

"5. An apparatus for purification of automobile exhaust gas, including an adsorbent structure as defined in

claim 1 or claim 2, when arranged in the exhaust gas system of an automobile."

Claim 6 for the designated states BE, ES, IT and SE as well as for the designated states DE, FR and GB reads as follows:

"6. An apparatus for purification of automobile exhaust gas, including a catalyst for hydrocarbon conversion and an adsorbent structure as defined in claim 1 or claim 2, when arranged in the exhaust gas system of an automobile."

Claim 7 for the designated states BE, ES, IT and SE reads as follows:

"7. An adsorbent for purification of automobile exhaust gas, comprising a high-silica zeolite characterised in that the zeolite has Si/Al ratio of not less than 48 and is an H (proton) type zeolite or a zeolite obtained by subjecting an H (proton) type zeolite to ion exchange with at least one noble metal selected from Pt, Pd, Rh, Ir and Ru, when arranged in the exhaust gas system of an automobile."

Claim 7 for the designated states DE, FR and GB reads as follows:

"7. An adsorbent for purification of automobile exhaust gas, comprising a high-silica zeolite having a Si-Al ratio of not less than 48 and being either a H (proton) type zeolite or a zeolite obtained by subjecting an H (proton) type zeolite to ion exchange with at least one noble metal selected from Pt, Pd, Rh, Ir and Ru, the

percent ion exchange of the noble metal being 30 to 85%, when arranged in the exhaust gas system of an automobile."

IV. The following documents played a role in the appeal proceedings:

- E1: Zeitschrift für Chemie, Heft 8, 1982, pages 277 to 288
- E3: EP-A-0 427 970
- E4: EP-A-0 369 576
- E5: WO-A-89/10470
- E6: FR-A-1 363 723
- E7: US-A-5 087 348
- E8: US-A-5 030 759
- E9: Abstract of an internet presentation of the Tosoh Corporation, Tokyo, Japan
(www.tosoh.com/EnglishHomePage/tcdzeo.htm)

V. Appellant I (opponent) mainly argued that: documents E7 to E9, filed with letter of 9 September 2004, should be admitted into the proceedings; the invention as defined in claim 1 for the designated states DE, FR and GB did not meet the requirements of Article 100(b) EPC and, in the present case, the disclaimer introduced in the set of claims for the designated states DE, FR and GB was not admissible. Moreover, the subject-matter of claim 1 for the designated states DE, FR and GB was not novel with respect to E3 and to E4; the subject-matter of claim 1 for the designated states BE, ES, IT and SE was not novel when compared to E4. Finally, the adsorbent structure of claim 1 did not involve an inventive step in comparison to E4 in combination with E1 and that of claim 3 did not involve an inventive step when compared

to either E6 in combination with E1 or E4 in combination with E5.

Appellant I requested that the patent be revoked.

Appellant II (patentee) mainly argued that: documents E7 to E9 should not be admitted into the proceedings because they were late filed and because E7 had been disregarded by the Board in its intermediate decision; the disclaimer introduced in the set of claims for the designated states DE, FR and GB was in line with G1/03 and thus, allowable; novelty of claim 1 was given with respect to E3, because in E3, the noble metal was loaded on the zeolite by immersion and by ion exchange, and therefore, the amount of noble metal deposited was not directly linked to the ion exchange ratio. Moreover, E4 did not disclose at all to load a zeolite by ion exchange, or the fact that an S-115 zeolite was compulsorily of the proton type.

He contested that a skilled person would refer to E1 in order to solve the problem of purifying exhaust gases of an internal combustion engine. Furthermore, the patent did refer to a zeolite as part of an adsorbent structure, whereas E1 indicated that high silicate zeolites were useful as catalysts but did not prove that they exhibit a real adsorption property. Therefore, the teaching of E1 could not suggest using such a zeolite as an adsorbent. He also considered that E6 was too old to constitute the starting point of the claimed method, and did not mention nor suggest using a zeolite.

Appellant II requested that the patent be maintained on the basis of claims 1 to 7 for the designated states DE, FR and GB and of claims 1 to 7 for the designated states BE, ES, IT and SE filed in the oral proceedings.

Reasons for the Decision

1. *Documents E7 to E9:*

These documents were filed with letter of 9 September 2004, thus, more than on month before the oral proceedings.

Although the Board in its intermediate decision refused to introduce E7 into the proceedings with respect to the main request because E7 was only sent four days before the first oral proceedings (which took place on 27 June 2003), this does not prejudice the introduction of E7 against the auxiliary requests.

E7 as well as E8 have been published after the priority date of the patent in suit (E7: 11 February 1992 and E8: 09 July 1991; patent: 9 November 1990). E9 does not bear any publication date.

However, Appellant I referred to said documents only to show the composition of zeolites mentioned in E3 or E4.

Appellant II objected that said documents could have been filed at an earlier stage of the proceedings and that since said documents were published after the priority date, the public might not have been aware of the composition of the zeolites mentioned therein before their publication.

According to the decision of the Enlarged Board of Appeal G 1/92 (OJ EPO 1993, 277), the chemical composition of a product is state of the art when the product as such is available to the public and can be analysed and reproduced by the skilled person, irrespective of whether or not particular reasons can be identified for analysing the composition. Thus, the chemical composition of the zeolites referred to in E3 and E4 was state of the art before the priority date of E3 and E4 because they were already available to the public. Thus, E7, E8 and E9 do not introduce new information but solely document what was already state of the art and therefore, said documents are introduced into the proceedings.

2. *Insufficiency of disclosure (Article 100(b) EPC):*

Appellant II argued that Article 100(b) EPC refers to the European patent as a whole and not only to the claims. Thus, the objection of insufficiency of disclosure, i.e. that the patent does not disclose the invention in a manner sufficiently clear for it to be carried out by a person skilled in the art, cannot simply result from the amendment of the claims and, if it were justified, would have been present right from the beginning of the opposition procedure. Therefore, said objection has to be considered as a fresh ground for opposition which could not be introduced without agreement of the patentee.

According to the decision of the Enlarged Board of Appeal G 9/91 (OJ EPO 1993, 408) "in case of amendments of the claims or other parts of a patent in the course

of opposition or appeal proceedings, such amendments are to be fully examined as to their compatibility with the requirements of the EPC".

In the present case, a feature of the description, which so far had not been considered as an essential feature of the invention, has been introduced into the claims.

Therefore, an objection under Article 100(b) EPC which arises from these amendments cannot be considered as being a fresh ground for opposition.

Appellant I merely stated that the newly added features concerning the percent ion exchange of the noble metal could not be verified by a skilled person. He did not provide any evidence that a skilled person faced with the problem of establishing the percent ion exchange of noble metal was unable to proceed. The Board is satisfied that it would lie within the capability of a skilled person to determine the amount of H-proton present in a zeolite structure as well as the amount of noble metal ions (for example as suggested in E1, where it is indicated that the Si/Al ratio is representative of the number of protons available for ion exchange and that the variation of acidity is representative of the number of exchanged ions, see also section 4.1.3, below) and thus, to calculate the percent ion exchange of noble metal.

Therefore, the objection raised under Article 100(b) EPC does not prejudice the maintenance of the patent in suit.

3. *Disclaimer - Article 123(2) and (3) EPC:*

- 3.1 In its decision G 1/03 the Enlarged Board of Appeal set out the criteria for assessing the allowability of a disclaimer which is not disclosed in the application as filed. In the present case, only one of the listed criteria applies, i.e. "a disclaimer may be allowable in order to restore novelty by delimiting a claim against state of the art under Article 54(3) and (4) EPC."

Furthermore, as indicated in section 2.6.5 of the decision "... a disclaimer may serve exclusively the purpose for which it is intended and nothing more. In the case of a disclaimer concerning conflicting applications, its purpose is to establish novelty with respect to a prior art application in the sense of Article 54(3) EPC ... If a disclaimer has effects which go beyond its purpose as stated above, it is or becomes inadmissible."

- 3.2 In the present case, E3 which is a prior art document according to Article 54(3) EPC, discloses the first alternative defined in claims 1, 5 and 7 according to the main request; i.e. that the zeolite is an H-proton zeolite having a Si/Al ratio not less than 48. Thus, the disclaimer introduced in claims 1, 5 and 7 for the designated states DE, FR, GB and excluding the zeolite disclosed in E3 is necessary to restore novelty.

By excluding from the zeolites having an Si/Al ratio not less than 48, those zeolites which are obtained by mixing a zeolite with silica sol, drying and calcining, Appellant II has limited the excluded subject-matter to

the H-type zeolite having an Si/Al ratio not less than 48 effectively disclosed in E3. Thus, the disclaimer does not go beyond its purpose. Furthermore, as is the case here, a disclaimer based solely on an Article 54(3) EPC prior art document is not objectionable under the terms of Article 123(2) EPC, see decision T 529/99 (OJ EPO 2003, 452).

Consequently, the disclaimer is admissible and does not contravene the provisions of Article 123(2) EPC.

- 3.3 Appellant I argued that the teaching of E3 goes beyond the specific example of page 4 and was not limited to catalysts comprising silica sol. However, this example is the sole which explicitly mentions the composition, and even if E3 could suggest using a different composition, no such other composition is explicitly disclosed in E3 and therefore, such other composition would only have to be considered with respect to inventive step and not with respect to novelty. Appellant I also referred to the decision T 898/91 dealing with an amendment, which removed a range of values from the claimed subject and was not considered by the Board to be a disclaimer. The present case differs from that of the cited decision in that it does not remove a range of values but a single composition by disclaiming it to establish novelty with respect to a document cited under Article 54(3) EPC. Thus, decision T 898/91 is not pertinent for this case.

3.4 Besides the disclaimer, the feature "the percent ion exchange of the noble metal being 30 to 85%" has been introduced into some independent claims. This feature is disclosed in the description as originally filed, page 13, ultimate paragraph to page 14, line 3 and does not extend the protection conferred by the claims in which it has been introduced. Thus, this amendment does not contravene the provisions of Article 123(2) and (3) EPC.

Additionally, the description has been adapted to the new set of claims.

4. *Novelty:*

4.1 With respect to E3:

4.1.1 E3 is state of the art according to Article 54(3) and (4) EPC for claim 1 for the designated states DE, FR, GB which are likewise designated in E3.

Since zeolites having an Si/Al ratio not less than 48 and obtained by mixing a zeolite with silica sol, drying and calcining, are excluded by the disclaimer, the sole explicitly disclosed example of E3 is no longer opposable. Appellant I argued that the teaching of E3 included also other compositions not comprising silica sol. As indicated in section 3.3 above, these equivalent compositions would however only have to be considered with respect to inventive step and not with respect to novelty.

4.1.2 Thus, the remaining question is whether or not E3 discloses zeolites of the H-type which were subjected

to ion exchange with at least one noble metal selected from Pt, Pd, Rh, Ir and Ru, the percent ion exchange of the noble metal being 30 to 85%.

Appellant I referred in this respect to the loading amount disclosed in table 4 of E3. He stated that if the solution, in which the catalyst support is wash-coated, had a composition comparable to the composition of the patent in suit, the percent ion exchange would be the same. Furthermore, since E3 did not indicate any percent ion exchange, E3 would implicitly disclose a percent ion exchange of 0 to 100%. Consequently, the range of 30 to 85% claimed in the patent in suit was far too broad to consider that the subject-matter of claim 1 could be a selection invention.

The Board cannot agree to this. It is clearly stated in the description of E3, page 3, lines 33 to 35 and 42, 43 that the noble metals are loaded on the zeolite by ion exchange and immersion. Thus, it is not possible to assess, when starting from the total amount of noble metal loaded on the zeolite, which amount has been loaded by ion exchange and which amount has been loaded by immersion.

Therefore, it is neither possible to deduce from E3 the amount of the noble metal loaded by ion exchange, nor to state that E3 implicitly discloses to load a zeolite by ion exchange with a noble metal, the percent ion exchange of noble metal being of 0 to 100%, since this would presuppose that all the deposited noble metal has been loaded by ion exchange. Thus, the structure defined in claim 1 cannot be considered to be a

selection invention with respect to what is implicitly or explicitly disclosed in E3 either.

4.1.3 Furthermore, concerning the ion exchange capacity, E1 (page 282, paragraph 2.3) states:

"Die Ionenaustauscheigenschaften der ZSM-5-Zeolithe können wie die Acidität als Funktion des $\text{SiO}_2/\text{Al}_2\text{O}_3$ Verhältnisses betrachtet werden.

Da die Ionenaustauschkapazität von der Anzahl der verfügbaren Gegenionen zu vierfach koordiniertem Aluminium im Zeolithgitter abhängig ist, folgt, daß das Ionenaustauschvermögen hoch silikatischer Zeolithe niedriger ist als bei anderen Zeolithtypen und mit ansteigendem Modul weiter abnehmen muß."

Thus, there is a relation between the Si/Al ratio and the number of protons available for ion exchange.

As shown in E9 (page 4) within a same appellation Mordenite (H-proton type) the Si/Al ratio can vary from 7.5 to 100.

Therefore, the number of H-proton (which may be subject to exchange) may vary even within a single appellation depending on the Si/Al ratio and therefore the weight (quantity) of the noble metal exchanged or its concentration in the solution, cannot directly be linked to an exchange percentage without knowing the total amount of H-proton present in the zeolite before said exchange takes place.

4.1.4 Consequently, the subject-matter of claim 1 for the designated states DE, FR, GB is novel with respect to E3.

4.2 With respect to E4:

E4 discloses in example III (page 6) the use of a TSZ-390HUA zeolite. E4 does not indicate the Si/Al ratio of this zeolite. Appellant I considered that the Si/Al ratio can be deduced from E9 page 3, third line, right column, last table of the page. However, this column clearly refers to a HSZ-390HUA zeolite. There is no indication that this zeolite has the same Si/Al ratio that the zeolite of E4 and it cannot lead to the conclusion that the TSZ-390HUA of E4 is of the H-type, all the more because HSZ appears to stand for High Silica Zeolite (see E9, two first lines of page 3) and consequently, TSZ appears to stand for something else.

Furthermore, for the same reasons as stated with respect to E3, the ion exchange ratio is not deducible from the platinum concentration of the solution.

E4 also discloses the use of S-115 zeolite (page 5, example I), however there is no indication that an S-115 zeolite is of the H-type. Appellant I considered that since the zeolite S-115 was mixed with pseudoboehmite, water and nitric acid so that the pH of the slurry decreased to about pH 3.7 and rolled overnight in a roller mill with alumina balls, the zeolite became of the H-type. However, in view of the objections of Appellant II Appellant I has not provided any evidence for this allegation. Since it is up to the party which makes the allegation to prove that such

allegation is correct, the Board cannot rely on such allegation.

E4 indicates also that the zeolites of interest can be selected from a group of zeolites such as mordenite, H-ferrierite, H-offretite, ZSM-5 ...

However, there is no indication that the mordenite and the ZSM-5 referred to in E4 are of the H-type (E3 for example discloses also Na-types of these zeolites) and even if H-ferrierite and H-offretite are zeolites of the H-type, there is no indication that their Si/Al ratio is of not less than 48.

Thus, E4 does not disclose a zeolite which is of the H-type and which has a Si/Al ratio of not less than 48. Therefore, the first alternative of claim 1 for all designated states is novel with respect to E4.

Furthermore, E4 does not disclose to load the noble metal on an H-type zeolite by ion exchange. Therefore the second alternative of claim 1 for all designated states is novel with respect to E4.

4.3 Since none of the cited documents discloses in combination all the features of independent claim 1 for the designated states BE, ES, IT and SE as well as for the designated states DE, FR and GB, the subject-matter of claim 1 of both sets of claims is new.

Appellant I agreed that if the subject-matter of claim 1 was found to be novel, this conclusion would apply mutatis mutandis to that of claims 5, 6 and 7 which therefore are likewise new for the designated

states BE, ES, IT and SE as well as for the designated states DE, FR and GB.

The novelty of the subject-matter of claim 6 (for all designated states) was already acknowledged in the Board's intermediate decision.

Novelty of the subject-matter of claim 3 (for all designated states) was not at stake in these proceedings and the Board is satisfied that the subject-matter of claim 3 is also novel with regard to the cited state of the art.

5. *Inventive step:*

5.1 E4 is the closest prior art document for the product claims.

E4 discloses a honeycomb structure having a periphery and two ends, including a plurality of passages which are defined by partition walls and extend in an axial direction between the ends (see page 5, lines 35 to 38); and

a zeolite coated on the honeycomb structure which zeolite is either a high-silica zeolite having a Si/Al ratio of not less than 48 (S-115) or an H (proton) type zeolite.

Although E4 does not explicitly refer to an adsorbent structure, but to a catalyst structure, such a catalyst structure may also be regarded as an adsorbent structure, since it is well known that zeolites are

adsorbents (see for example E1, page 1, left-hand column, paragraph 2).

5.2 Starting from this state of the art, the object underlying the subject-matter of claims 1, 5, 6, 7 for the designated states BE, ES, IT and SE and for the designated states DE, FR and GB is to provide an adsorbent, an adsorbent structure or an apparatus including an adsorbent having an improved heat resistance (see patent in suit, page 2, line 55 to page 3, line 3; page 4, lines 1, 2 and 5, 6).

5.3 Although high-silica zeolites are well known, there is no suggestion in the cited documents for using an H (proton) type zeolite having a high-silica ratio as an adsorbent or adsorbent structure in order to improve the heat resistance.

5.4 Appellant I considered that the subject-matter of claim 1 would only differ from example I of E4 in that the zeolite is of the H (proton) type and that the problem to be solved would be to increase the heat resistance and the catalytic activity of the zeolite.

He argued that, from the teaching of E1 (section 3, "Anwendungen"), it would be obvious for a skilled person that H-type zeolites would be useful in cracking and methanol-conversion and thus, in increasing the catalytic activity.

Therefore, a skilled person would select the H-type of the zeolite disclosed in E4 and thus arrive at the claimed subject-matter.

5.5 This cannot be accepted by the Board.

E4 refers to a catalyst system for purifying exhaust gases from organically fuelled energy power plants. Thus, even if E1 refers to cracking and methanol-conversion, a skilled person would not consider E1 for improving the catalytic activity of a system as disclosed in E4 and which is designed to convert nitrogen oxides, hydrocarbons and carbon oxides to nitrogen gases, carbon dioxide and water (E4, page 2, lines 40 to 44). Moreover, E1 neither indicates nor suggests that an H-type zeolite might exhibit improved heat resistance and thus, can effectively solve the problem posed (as indicated in section 5.2 above).

5.6 Appellant I argued also that the subject-matter of claim 1 would differ from a catalyst system comprising an H-type zeolite as disclosed in E4, in that the said zeolite would have a Si/Al ratio of not less than 48.

In this case the problem to be solved would be to increase the adsorption capacity of the structure. However, it would be clear for a skilled person in view of table 3, page 283 of E1 that the adsorption property of an H-ZSM-5 (of the H-type) increases when Si/Al ratio increases.

The Board cannot agree to this either, since the adsorption capacity of an H-ZSM-5 is not unambiguously derivable from the table 3 of E1. According to this table, the adsorption capacity does not significantly vary when the Si/Al ratio passes from 30 to 61 (thus when passing beyond 48). Furthermore, the adsorption capacity does not continuously increase with increasing

Si/Al ratio for all types of adsorbed molecules. Therefore, E1 does not suggest that a Si/Al ratio not less than 48 would improve the adsorption capacity of a zeolite.

Furthermore, neither E4 nor E1 discloses to deposit the noble metal by ion exchange. Therefore, even if a skilled person would select the H-type of the zeolite disclosed in E4, the above mentioned feature would still be lacking. Thus, a combination of E4 and E1 would not disclose the second alternative of claim 1 either.

5.7 Thus, the subject-matter of claim 1 (for all designated states) is not obvious in view of E4 in combination with E1. Consequently, the subject-matter of claims 1, 5, 6, 7 for the designated states BE, ES, IT and for the designated states DE, FR and GB involves an inventive step.

5.8 E6 (page 3, right hand column, section B and page 4) discloses a method for controlling emission of unburnt hydrocarbons from an internal combustion engine at start-up, comprising the steps of:

providing a catalyst (40) for hydrocarbon conversion and an adsorbent (24) capable of adsorbing hydrocarbons when cold, said catalyst and said adsorbent being carried together on a support (Figure 3) or carried on respective supports (Figure 1) with the catalyst downstream in the exhaust gas flow from the engine relative to the adsorbent,

starting the engine when cold, with the adsorbent and the catalyst in a cold state, and

heating said catalyst electrically (heater 46, 46'), whereby unburnt hydrocarbons are first adsorbed from the cold exhaust gas by said adsorbent and thereafter desorbed from the adsorbent and reacted by said electrically heated catalyst.

5.9 Starting from this state of the art, the object to be achieved is the provision of a method for controlling emission of unburnt hydrocarbons from an internal combustion engine at start-up in which the adsorbent used for adsorption of the hydrocarbons has an improved heat resistance (see patent in suit, page 2, line 55 to page 3, line 3; page 4, lines 1, 2 and 5, 6).

5.10 This object is achieved by the distinguishing features of the invention, i.e. the provision of an adsorbent comprising either a zeolite which has a Si/Al ratio not less than 48 and is an H (proton) type zeolite or a zeolite obtained by subjecting an H (proton) type zeolite to ion exchange with at least one noble metal selected from Pt, Pd, Rh, Ir and Ru.

5.11 Appellant I argued that the subject-matter of claim 3 would be obvious in view of E6 in combination with E4 and E1 or in view of E4 in combination with E5 taking into account the capability of a skilled person.

However, neither E6 nor E5 discloses the use of zeolites as an adsorbent structure and E4 does not disclose zeolites which are of the H-type and have an Si/Al ratio not less than 48 or which are obtained by

subjecting an H (proton) type zeolite to ion exchange with at least one noble metal.

Furthermore, as already stated in sections 5.5 to 5.7 a combination of E4 and E1 would not suggest a zeolite obtained by subjecting an H (proton) type zeolite to ion exchange with at least one noble metal.

5.12 Finally, the skilled person is given no hint or suggestion leading him to the conclusion that heat resistance could be improved by using the claimed adsorbent. Therefore, the subject-matter of claim 3 for the designated states BE, ES, IT and SE and for the designated states DE, FR and GB involves an inventive step.

Order

For these reasons it is decided that:

The case is remitted to the first instance with the order to maintain the patent on the basis of:

Claims: 1 to 7 for the designated states DE, FR and GB filed in the oral proceedings,
1 to 7 for the designated states BE, ES, IT and SE filed in the oral proceedings

Description: pages 2, 2a, 3 to 11 filed in the oral proceedings

Drawings: Figures 1 and 2 as granted

The registrar:

The Chairman:

G. Magouliotis

M. Ceyte