BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS	**BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE**	**CHAMBRES DE RECOURS DE L'OFFICE EUROPÉEN DES BREVETS**

Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision
of 7 March 2022

Case Number: T 0423/19 - 3.3.06

Application Number: 10732120.0

Publication Number: 2387463

IPC: B01J37/02, B01J29/40, B01J29/70, B01J35/02, B01J35/04, B01J35/10, B01J29/44, B01J23/44, B01D53/94, B01J29/12, B01J29/74, B01J35/00

Language of the proceedings: EN

Title of invention:
LAYERED Diesel OXIDATION CATALYST COMPOSITES

Patent Proprietor:
BASF Corporation

Opponents:
Umicore AG & Co. KG
Johnson Matthey Public Limited Company

Headword:
Diesel catalyst/BASF

Relevant legal provisions:
EPC Art. 56, 83

Keyword:
Inventive step - main request (no) - auxiliary request (yes)
Sufficiency of disclosure - (yes)

Decisions cited:
T 0824/05, T 2221/10, T 1305/15

Catchword:

Beschwerdekammern

Boards of Appeal

Chambres de recours

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

Case Number: T 0423/19 - 3.3.06

DECISION
of Technical Board of Appeal 3.3.06
of 7 March 2022

Appellant: (Opponent 1)	Umicore AG & Co. KG Rodenbacher Chaussee 4 63457 Hanau-Wolfgang (DE)
Representative:	Vossius & Partner Patentanwälte Rechtsanwälte mbB Siebertstrasse 3 81675 München (DE)
Respondent: (Patent Proprietor)	BASF Corporation 100 Park Avenue Florham Park, NJ 07932 (US)
Representative:	Altmann Stößel Dick Patentanwälte PartG mbB Isartorplatz 1 80331 München (DE)
Party as of right: (Opponent 2)	Johnson Matthey Public Limited Company 5th Floor 25 Farringdon Street London EC4A 4AB (GB)
Representative:	Boult Wade Tennant LLP Salisbury Square House 8 Salisbury Square London EC4Y 8AP (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 4 December 2018 to maintain European Patent No. 2387463 in amended form.**

Composition of the Board:

Chairman	J.-M. Schwaller
Members:	S. Arrojo
	J. Hoppe

Summary of Facts and Submissions

I. Opponent 1 filed an appeal contesting the decision of the Opposition Division to maintain European patent No. 2 387 463 on the basis of the claims of the **main request** filed with letter dated 6 July 2017, claim 1 thereof reading:

"1. A layered Diesel oxidation catalyst composite comprising:
a Diesel oxidation catalytic material on a carrier, the catalytic material comprising a palladium component in an amount in the range of 5 to 75 g/ft^3 (0.18 to 2.65 kg/m^3) and at least two layers: a hydrocarbon trap layer comprising at least one molecular sieve, the hydrocarbon trap layer being substantially free of palladium; and a palladium-containing layer that comprises the palladium component, and is substantially free of a molecular sieve, wherein the palladium component is located on a high surface area, porous refractory metal oxide support;
wherein the high surface area, porous refractory metal oxide support comprises alumina having a pore volume in the range of 0.5 to 1.5 cm^3/g and an average pore diameter of at least 75 Å."

II. With its statement of grounds of appeal, opponent 1 and appellant requested that the above decision be set aside and that the patent be revoked in its entirety, arguing that the thus claimed invention was insufficiently disclosed and not inventive in view of document D18 (US 2008/0045405 A1) or document D1/D1a (JP 2005-262071/EN translation) alone or in the light of documents D3 (WO 99/56876), D11 (US 5,849,255) or D12 (WO 2008/042084 A1). The appellant also submitted documents D28 (T. Trinh Bui et al., "*Investigation of typical properties of nanocrystalline iron powders prepared by ball milling techniques*", Advances in Natural Sciences: Nanoscience and Nanotechnology, 2013) and D29 (Wikipedia "Magermotor").

III. In its reply filed on 27 August 2019, the patent proprietor and respondent requested that the appeal be dismissed and the patent be maintained in the form upheld by the opposition division, or auxiliarly, on the basis of the claims of one of auxiliary requests 1 to 11 filed therewith, wherein

Claim 1 of **auxiliary request 1** corresponds to that of the main request, wherein the molecular sieve is defined as *comprising "a beta-zeolite, ZSM-5, zeolite-Y or combinations thereof."*

Claim 1 of **auxiliary request 2** corresponds to that of auxiliary request 1, wherein the catalytic material is defined as *further comprising "a platinum component, in the range of 10 g/ft^3 to 150 g/ft^3 (0.35 to 5.30 kg/m^3), an amount of up to 20% by weight of the platinum component being incorporated into the at least one molecular sieve, and an amount of at least 80% by weight of the platinum component being on the high surface area, porous refractory metal oxide support of the palladium-containing layer."*

The proprietor also requested not to admit into the appeal proceedings documents D27 (Heck et al., "*Catalytic Air Pollution Control*", 2nd Ed., Chapter 8, pages 186-200, 2002), filed on 26 July 2018 during first instance proceedings, and D28, and to disregard under Article 12(4) RPBA 2007 those passages of the grounds of appeal which merely repeat the arguments presented during the first instance proceedings.

IV. In its preliminary opinion, the board held that the invention according to the main request was sufficiently disclosed but that its subject-matter was not inventive in view of D1/D1a as closest prior art, that the subject-matter of the claims of auxiliary request 1 was also not inventive in view of D1/D1a and that auxiliary request 2 appeared to meet the requirements of the EPC.

V. In response to this preliminary opinion

- the respondent filed additional arguments and submitted document D30/D30a (JP 2002273232A/EN translation);
- opponent 2 (party as of right) announced that it would not attend the oral proceedings;
- with a letter dated 7 February 2022, the appellant filed additional arguments and requested not to admit document D30/D30a into the appeal proceedings.

VI. With a further letter dated 28 February 2022, the respondent requested not to admit under Article 13(2) RPBA 2020 certain submissions in the appellant's letter of 7 February 2022.

VII. At the oral proceedings, which took place on 7 March 2022 by videoconference, the parties' final requests were as follows:

Opponent 1 and appellant requested that the appealed decision be set aside and that the patent be revoked in its entirety.

The proprietor and respondent requested that the appeal be dismissed and the patent be maintained in the form upheld by the opposition division or, as an auxiliary measure, on the basis of the claims of one of auxiliary requests 1 to 11 filed with the reply to the appeal on 27 August 2019.

Reasons for the Decision

1. Admittance of certain submissions from the appellant

1.1 The respondent argued that certain passages of the grounds of appeal did not challenge the decision under appeal but, instead, simply repeated the arguments brought forward during first instance proceedings. These arguments should thus be disregarded under Article 12(4) RPBA 2007.

1.2 The board disagrees with this view, because pointing out that a particular line of argumentation has not been properly addressed by the opposition division or that the reasons invoked were weak or incorrect constitutes, as such, an argument contesting the first instance decision. Consequently, the board sees no reason to disregard the cited passages from the grounds.

1.3 The respondent further argued that some arguments brought forward with the appellant's letter of 7 February 2022 were late-filed and should not be admitted under Article 13(2) RPBA 2020.

1.4 The board disagrees with the respondent, because none of the arguments brought forward in the appellant's letter of 7 February 2022 deviate from the facts and lines of argumentation previously presented by this party. Rather, they are to be qualified as mere specifications that are part of the ongoing discussion and do not represent an amendment of the party's case in the sense of Article 12(4) RPBA 2020. There is therefore no reason to conclude that these submissions should be disregarded under Article 13(2) RPBA 2020.

2. Admittance of late-filed documents

2.1 On the one hand, the respondent requests not to admit documents D27 and D28 into the appeal proceedings under Article 12(4) RPBA 2007.

On the other hand, the appellant requests not to admit document D30/D30a under Article 13(2) RPBA 2020.

2.2 The respondent argued that D27 was not admitted by the opposition division and should therefore also be disregarded by the board. While the board notes that the opposition division did actually not decide on this matter, document D27 is not relevant for the underlying decision and was not even cited by any of the parties to support their arguments at the oral proceedings, so there is no need to decide on its admittance.

2.3 The board considers that it is also not necessary to discuss the admittance of D28 and D30/D30a, because the content of these documents has no bearing on the outcome of the underlying decision.

In particular, the board has concluded that the invention is sufficiently disclosed even if (as allegedly shown in D28) a milling step would modify the pore volume and/or the average pore diameter (see point 5.2.2 of this decision). The board has also concluded that document D1/D1a constitutes a valid starting point, even when the content of document D30/D30a is taken into account (see point 3.1 of this decision).

3. Main request - Inventive step

The requirements of Article 56 EPC are not complied with for the following reasons:

3.1 Closest prior art

3.1.1 Document D1a discloses (par. [0001] to [0003], claim 1, examples 1 and 30) an exhaust gas purifying catalyst including a zeolite layer and an alumina layer deposited on a carrier. The zeolite layer (used as hydrocarbon adsorbing layer) does not include any noble metal (see example 1) and the alumina layer includes at least one noble metal selected from the group consisting of Pt, Pd and Rh (see claim 1). The alumina material is formed by small pore alumina with an average pore diameter of 90 to 110 Å and a pore volume of 0,40 to 0,55 cm^3/g and large pore alumina with an average pore diameter of 160 to 260 Å and a pore volume of 0,60 to 0,95 cm^3/g (see claims 2 and 3).

3.1.2 The respondent argued that D1/D1a could not be regarded as the closest prior art because it related to a three-way catalyst and not to a Diesel oxidation catalyst as defined in claim 1. In particular, it argued that the references in D1/D1a (par. [0002]) to a "lean combustion operation in a lean combustion automobile" and to the removal of "HC at low temperatures" concerned the background art and had to be interpreted within the context of the whole document. As indicated in paragraph [0003] of D1/D1a, the catalyst described therein was based on the 3-way catalyst disclosed in D30/D30a, which was arranged to treat gases from engines alternating lean and stoichiometric/rich combustion ratios. The solution proposed in D30/D30a and followed in D1/D1a consisted on (par. [0007]) forming a layer including an alkali earth metal to retain NO_x gases during lean combustion in order to subsequently purify these noxious gases in the presence of reducing substances such as CO or HC during periods under stoichiometric/rich air-fuel ratios. Since Diesel engines operated under permanent lean conditions and the above cited NO_x-retaining layer (i.e. comprising an alkali earth metal such as barium) would be both unnecessary and detrimental in a Diesel catalyst, it was apparent that document D1/D1a was restricted to 3-way catalysts and would not be considered for developing a Diesel catalyst as defined in claim 1. D1/D1a further addressed the problem of preventing the peeling of the zeolite and alumina layers (end of par. [0004]), for which it proposed using alumina materials having certain pore volumes and average diameters (par. [0006]). This document was therefore not concerned with the problem of the invention (namely improving the light-off performance).

The respondent concluded that document D1/D1a and the invention related to different technical fields and solved different technical problems, so that a skilled person would only consider starting from D1/D1a as closest prior art with the benefit of hindsight.

By contrast, document D18 concerned a Diesel catalyst and addressed the problem of improving light-off performance, so it was apparent that this document represented the closest prior art.

3.1.3 In the board's view, the relevant question when selecting the closest prior art is whether a skilled person would realistically consider starting from a given document in its attempt to solve the subjective technical problem of the underlying invention.

Concerning the technical field, the board is not convinced that document D1/D1a is restricted to 3-way catalysts, even if this document explicitly refers to D30/D30a (which discloses a 3-way catalyst) as an example of known exhaust catalysts, and that D30/D30a concerns a catalyst for an engine alternating lean and rich/stoichiometric combustion periods. For the board, there are clear indicators in D1/D1a that this document relates to a broader technical context including Diesel exhaust catalysts. It is to be noted that 3-way catalysts are normally characterised by the presence of rhodium, as also proposed in D30/D30a, but this precious metal is only defined as an optional alternative in claim 1 and paragraph [0087] of D1/D1a. Furthermore none of the 65 exemplary catalysts described in D1/D1a includes rhodium. The board is therefore not convinced, as argued by the respondent, that the absence of rhodium in the examples of D1/D1a is justified by the fact that these catalysts were not used to test the catalytic performance but only the peeling of the layers, because it would be technically absurd to omit the preferred rhodium component - but nevertheless use platinum - from the embodiments which D1/D1a describes as the "preferable examples" (see par. [0087]). Furthermore, there is no reason to conclude that the noble metals would have a negligible effect on the adhesion of the layers, because in this case platinum should also have been omitted, and that they are therefore irrelevant for the peeling tests in D1/D1a.

In view of the above considerations, it is clear that the reference in paragraph [0002] of D1/D1a to "lean combustion operation in a lean combustion automobile" encompasses all engines operating under lean conditions, including those described in D30/D30a but also lean combustion engines such as Diesel engines, which are the most commonly known lean burn engines. The board also notes that, contrary to the respondent's arguments, the presence of alkali earth metals cannot be considered to be incompatible with a Diesel catalyst in the sense of the patent because, as pointed out at the oral proceedings, both D1/D1a (par. [0015]) and the opposed patent (par. [0030]) propose adding an alkali earth metal in the form of barium acetate to the catalyst. Barium is furthermore a well-known alumina surface area stabiliser, so there is no reason to conclude that this component would be detrimental for a Diesel exhaust gas catalyst.

The board also disagrees that D1/D1a should be excluded as closest prior art because it focuses on solving a problem different from that presented in the patent. The reference in paragraph [0002] of D1/D1a to the "need for one catalyst that satisfies the function of two catalysts, namely, a catalyst that can purify NO_x under excess oxygen and a catalyst that can remove HC at low temperatures" is not restricted to the background art, as the respondent argued, but clearly intends to present the broader problematic addressed within the technical context of document D1/D1a. This broader problematic is indeed rather close to that presented in the invention, because the purpose of removing "HC at low temperatures" is equivalent to the object of improving the light-off performance addressed in the opposed patent (see par. [0007]). It is also noted that the subsequent focus of D1/D1a on preventing the peeling of the layers simply represents a specific way of addressing the broader problematic presented in paragraph [0002], so it cannot be seen as a reason to exclude this document as starting point.

Furthermore and for the sake of completeness, the board notes that a skilled person might consider a document as a valid starting point for solving a subjective problem not explicitly addressed/mentioned in that document, provided that such problem is so broad or common within the underlying technical context of the document, that a skilled person would be prompted to address it even in the absence of any explicit incentive to do so (examples of such a situation can be the object of improving the catalytic performance of a catalyst or the cleaning efficiency of a detergent).

Concerning the argument that D18 is closer to the invention than D1/D1a, the board notes that if several documents are considered as suitable starting points, and only one of them leads to the conclusion that the invention is obvious, then this document should be regarded as the closest prior art even if the other appears to be technically closer *a priori* (see T 0824/05, reason 6.2).

In view of the above considerations, document D1/D1a is considered to represent the closest state of the art document, so the board will formulate the problem-solution approach starting from this document.

3.2 Differentiating features with respect to D1/D1a

The board notes that the pore volume and diameter of the large pore alumina in D1/D1a (0,60 to 0,95 mL/g and 160 to 260 Å according to claims 2-3 and par. [0014]) fall within the ranges defined in claim 1 at issue (i.e. 0.5 to 1.5 mL/g and at least 75 Å) and thus anticipate the corresponding feature in this claim, because the material is only required to comprise an alumina having these properties. In any case, the small pore alumina (0.40 to 0.55 g/mL and 90 to 110 Å according to claims 2-3 and par. [0014]) also falls within this scope, except when working at the bottom value of the pore volume range. It is furthermore noted that the use of Pd as noble metal for the catalyst is one of several options defined in claim 1 of D1/D1a. Since it is a single selection from a list, this feature is also directly disclosed in D1/D1a.

The only feature of claim 1 at issue which is not directly and unambiguously disclosed in D1/D1a is the concentration of the Pd in the alumina layer.

The subject-matter of claim 1 is thus considered to differ from D1/D1a in that the amount of palladium in the catalytic material is 0.18 to 2.65 kg/m^3

3.3 Problem solved by the invention

According to the opposed patent (par. [0007]) the object of the invention is to improve the light-off performance of the catalyst and to utilise the components as efficiently as possible. It is however not plausible that the differentiating feature with respect to D1/D1a (i.e. the Pd concentration range) would contribute in any meaningful way to obtain any of the above effects, because according to example 6 and par. [0057]-[0058] of the patent, the effect of improving the light-off performance is the result of segregating the zeolite and the Pd, a feature which is anticipated by D1/D1a. Furthermore The patent does not associate the defined concentration range of Pd with any technical effect, and the respondent has also not alleged that this differentiating feature would provide any specific effect.

The problem solved by the invention must therefore be reformulated in a less ambitious way than proposed in the patent, namely as that of providing an alternative Diesel oxidation catalyst.

3.4 Obviousness of the solution

The board has concluded that working within the range proposed in claim 1 at issue represents an obvious alternative, because it is apparent in view of a number of documents disclosing Pd-containing Diesel catalysts (see D11 (col. 4, line 37), D18 (par. [0039] and examples 6-7) and D22 (example 1)) that this range overlaps with conventionally used concentrations.

The subject-matter of claim 1 is therefore not considered to be inventive in view of the disclosure of document D1/D1a combined with the teaching of any one of D11, D18 or D22, so the main request does not meet the requirements of Article 56 EPC.

4. Auxiliary request 1 - Inventive step

The requirements of Article 56 EPC are not met for the following reasons:

4.1 Claim 1 of this request corresponds to that of the main request, wherein *"the molecular sieve comprises a beta-zeolite, ZSM-5, zeolite-Y or combinations thereof"*.

4.2 Since the exemplary zeolite in document D1/D1a (see example 1) is a beta-zeolite, claim 1 at issue does not include any additional differentiating feature with respect to this document, so that the argumentation and conclusions presented in the main request also apply to this request, which is thus not allowable under Article 56 EPC either.

5. Auxiliary request 2 - Sufficiency of disclosure

The requirements of Article 83 EPC are complied with for the following reasons:

5.1 The appellant followed two lines of argumentation in its objections under Article 83 EPC:

5.1.1 In a first line, it pointed out that the invention defined a layer substantially free of Pd, but interpreted this feature according to par. [0014] of the patent, and so the layer encompassed up to 10% of Pd. Since claim 1 encompassed Pd concentrations of 5 to 75 g/ft^3, the feature "substantially free of palladium" could imply concentrations higher than those in the Pd-containing layer (i.e. 10% of 75 g/ft^3 is higher than the bottom end value 5 g/ft^3). Furthermore, although the Pd-containing layer was defined as being "substantially free of a molecular sieve" to avoid silica poisoning of the Pd, the patent contemplated (par. [0038]) the use of silica-containing support materials for this layer such as zirconia-silica or titania-silica. Consequently, the scope of claim 1 encompassed non-workable embodiments and did not comply with the requirements of Article 83 EPC.

5.1.2 In a second line, the appellant indicated that the wording of claim 1 clearly implied that the volume and the average diameter of the pores had to be measured in the final catalyst. While the examples of the patent appeared to indicate that these parameters had to be measured in the original alumina material, there was no reason to consult the description to reinterpret the clear wording of the claim (reference was made to T 2221/10).

The pore volume and the average pore diameter of the original alumina material were not the same as those of the final product, because the addition of Pd and binders as well as the step of milling the alumina proposed in the examples of the patent would modify these parameters (D28 was cited to support that this was the case with the milling step). Furthermore, claim 1 defined that the refractory metal oxide comprised the alumina defined therein, so the claim also encompassed combinations with other metal oxides. Consequently, a skilled person trying to reproduce the invention would be in doubt as to how these parameters should be measured, in particular if, as defined in claim 1, they were to be measured in the final catalyst. The opponent concluded that this was a case of parameters which were so ill-defined (as in T 1305/15), that a skilled person would not be capable of determining the scope of protection even if the description were consulted.

5.2 The board disagrees with this argumentation because there is really no technical challenge in reproducing a hydrocarbon trap layer comprising molecular sieve and being substantially free of Pd, as doing this would simply require providing a layer including molecular sieve and not adding any Pd to it. The same applies to the Pd-containing layer free of a molecular sieve. The alleged contradictions between the description and the claims represent, if anything, a problem under Article 84 EPC but would not prevent a skilled person from reproducing the invention e.g. by simply following the wording of the claims. Moreover, as explained in point 6.1.3 of this decision, paragraph [0014] of the patent does not imply that the invention covers embodiments with a molecular sieve layer containing up to 10% of Pd, but simply provides an explanation for a special situation in which Pd is not added to this layer but is detected in small amounts after the catalyst has been used. Concerning the materials disclosed in paragraph [0038], it is clear for the board that a skilled person instructed by the unambiguous wording of claim 1 to use a layer "substantially free of a molecular sieve" would simply discard any material including silica such as zirconia-silica or titania-silica (i.e. as indicated above, the reference to these materials in the description might represent a problem of the claims not being supported by the description under Article 84 EPC but not a problem of insufficient disclosure).

5.2.1 The skilled person would also find no major technical challenge in reproducing a refractory metal oxide support comprising alumina with the pore volume and the average pore diameter defined in claim 1. The appellant's argument fails from the outset, because there is nothing in the wording of claim 1 which would imply that said parameters have to be measured in the final catalyst. On the contrary, the claim indicates that the layer is formed by locating Pd on the metal oxide support and that this support comprises alumina having a certain pore volume and and average pore diameter, so it is apparent that the pore volume/ diameter concern the alumina used as support (i.e. the original material) and not the alumina combined with the other components (otherwise the claim would refer to the pore volume/diameter of the Pd-containing layer and not that of the support material).

5.2.2 As to the alleged effect of the milling step on the pore structure, the board notes that the examples in the patent implicitly indicate that the pore volume and pore average diameter are measured before the milling step, because the milling is not performed on the alumina alone but on a slurry formed by alumina and other products, and it would be a technical nonsense to measure the pores of a material in a slurry containing a mixture of several components rather than doing it on the isolated component before forming the mixture. It is thus apparent that a skilled person would be capable of reproducing the invention (in view of the content of the patent as a whole) by measuring the pore volume and average pore diameter in the initial alumina material (before mixing and milling this material). Any outstanding doubt as to whether the pore volume and/or average pore diameter of the alumina measured at any other stage (e.g. after milling the slurry) are relevant for determining the scope of protection would represent a problem of demarcation under Article 84 EPC and not one of sufficiency of disclosure.

5.2.3 It is also noted that the pore volume and the average pore diameter are very common parameters in the underlying technical field with multiple well-known methods to measure them. While different methods might lead to different results, there is no reason to conclude that the differences would be significant, so this could be regarded, if anything, as a potential problem of demarcation under Article 84 EPC. The question of whether the potential divergences in the measurement of the parameters would prevent the skilled person from obtaining the desired technical effects is also not relevant, not only because there is no evidence that the minor differences between different measuring methods would lead to this problem, but also because an invention cannot be considered to be insufficiently disclosed on the basis that it does not provide an effect which is not defined in the claim (see BoA Case Law, 9th ed., II.C.3.2, 2nd par.)

5.2.4 All in all, the board concludes that a skilled person would find no major technical difficulties to carry out the invention by simply following the wording of the claims and, if necessary, by consulting the examples of the patent. Any outstanding question as to whether certain embodiments would fall within the scope of protection or not represents a problem of demarcation or support by the description under Article 84 EPC. The Board therefore concludes that the invention is sufficiently disclosed.

6. Auxiliary request 2 - Inventive step

The requirements of Article 56 EPC are met for the following reasons:

6.1 Interpretation of claim 1

Claim 1 at issue further defines that the catalyst contains 0.35 to 5.30 kg/m^3 of Pt, wherein the molecular sieve (i.e. zeolite) and the alumina layers respectively include an amount of up to 20% and of at least 80% of this noble metal.

6.1.1 The appellant argued that since the expression *"an amount of up to 20% by weight of the platinum component being incorporated into the at least one molecular sieve"* did not set any bottom value, it implicitly encompassed embodiments with no Pt in the molecular sieve layer.

6.1.2 The board disagrees with this view, because the explicit reference to an "amount" of Pt "being incorporated into" the molecular sieve layer necessarily implies that at least some Pt is added to this layer (i.e. $0\% <$ amount Pt in molecular sieve layer $\leq 80\%$).

6.1.3 As regards the interpretation of the feature "substantially free of Pd", for the board this implies that <u>no palladium</u> is (intentionally) added to the molecular sieve layer. In this respect, paragraph [0014] acknowledges the possibility that some Pd migrates/diffuses from one layer to the other when the catalyst is used, which would lead to catalysts according to the invention yet including minor concentrations of Pd in the zeolite-containing layer. This explanation does not imply that the invention covers catalysts with zeolite-containing layers having concentrations of up to 10% Pd, but simply that a catalyst might still be covered by the claims even if some Pd is detected in this layer after this catalyst is used, as long as this is demonstrably the result of undesired migration processes which, as the respondent argued, could be recognised by a decreasing gradient of low concentrations of Pd when moving from the alumina layer to the molecular sieve layer.

6.2 Closest prior art

6.2.1 Document D18 discloses (see example 6 and claim 1) a Diesel catalyst with two layers, both containing Pd and Pt. Example 6 of D18 further discloses the use of "large pore gamma alumina" (without specifying the pore volume and the average pore size) as well as Pt and Pd concentrations falling within the scope of claim 1.

By contrast, document D1/D1a does not explicitly disclose the incorporation of both Pd and Pt into the catalyst. Furthermore, the relevant examples 1 and 30 in D1/D1a do also not disclose a zeolite layer including noble metals, nor that the Pt is distributed between the layers such that up to 20% is in the molecular sieve layer and at least 80% is in the alumina layer. This document is therefore considered to represent a less promising springboard than D18, because it is structurally further away from the invention (i.e. it requires more modifications).

The board therefore concludes that the catalyst according to example 6 of document D18 represents the closest prior art.

6.3 Differentiating features with respect to D18

6.3.1 The opponent argued that the alumina in example 6 of D18 anticipated the pore volume and average pore diameter ranges of claim 1, because the expression "large pore gamma alumina" implied that the pore volume and diameter were respectively 0.9 ml/g and 240-170 Å (in view of D3, table 1A) or 0.60 to 0.95 ml/g and 160-260 Å (in view of par. [0014] of D1/D1a).

6.3.2 While this view was contested by the respondent, it will be assumed for the sake of the argument that the pore volume and the average pore diameter defined in claim 1 do not clearly distinguish the scope of the claim from the feature "large pore gamma alumina" in example 6 of D18.

6.3.3 The catalyst in example 6 of D18 does however not anticipate the distribution of the Pt between the layers as defined in claim 1 and the requirement that the zeolite-containing layer is "substantially free of Pd" (in D18 the zeolite-containing "top washcoat" includes a significant amount of Pd (13,8 g/ft^3)).

The subject-matter of claim 1 at issue therefore differs from the closest prior art in that i) the molecular sieve layer is substantially free of Pd and ii) the molecular sieve layer contains up to 20% of the Pt and the alumina layer contains at least 80% of the Pt.

6.4 Problem solved by the invention

6.4.1 According to the patent in suit the segregation of the zeolite and the Pd and the use of alumina with pores falling within the scope of claim 1 would improve the light-off performance of the catalyst (examples 1-4; par. [0040]-[0055]). Furthermore the use of two separate catalyst layers with segregated zeolite-Pd leads to an improved CO conversion efficiency (example 6, par. [0057]-[0058]).

6.4.2 The opponent argued that none of the comparative examples in the patent corresponded to example 6 of D18, so the patent did not provide any direct comparison with the closest prior art. Additionally, the observed technical effects were not necessarily related to the segregation of the zeolite and the Pd, as there were other differences which could account for those effects. The only problem solved by the invention was therefore to provide an alternative Diesel oxidation catalyst.

6.4.3 The board does not agree, because while it is true that none of the comparative examples corresponds exactly to the catalyst of example 6 of D18, comparative examples 3 and 6C are significantly close, particularly with respect to the non-segregation of the zeolite and the Pd. The board also notes that the opponent has not filed any counter-evidence to contest these results or to support the argument that the observed effects are associated with other parameters different from the segregation of the zeolite and the Pd, so it has effectively not discharged its burden of proof in this respect. The board therefore considers that in the absence of counter evidence, the examples in the patent suffice to conclude that the invention successfully provides the technical effects of improving CO conversion and light-off performance of the catalyst.

The problem solved by the invention is therefore the provision of a catalyst with an improved CO conversion and light-off performance.

6.5 Obviousness

6.5.1 The appellant argued that the segregation of the Pd and the zeolite according to the invention simply intended to prevent silica poisoning while reducing costs. The silica poisoning of Pd was however known from paragraph [0038] and examples 1 to 3 of D18, which were analogous to example 6 of the patent, because they compared the light-off performance of Pt/Pd containing washcoats with and without zeolite, concluding that there was an improvement when no zeolite was present. While comparative example 4 in D18 was presented as disadvantageous despite not including Pd in the zeolite layer, the detrimental effect was associated with the absence of Pt in the zeolite layer. Furthermore, document D18 (par [0029], claim 3) explicitly described embodiments in which the zeolite-containing top washcoat included very low amounts of Pd (i.e. Pt/Pd ratios of 10:1). Consequently, reducing or eliminating the Pd from the zeolite containing layer of example 6 represented an obvious alternative for the skilled person in view of the teachings of D18 alone.

The appellant also argued that the percentage distribution of Pt in the layers of example 6 of D18 would actually depend on the thickness of each layer. While the actual thicknesses were not specified in this example, claims 15 and 16 of D18 contemplated a broad range of relative thicknesses (5% to 70% for the top washcoat and 95% to 30% for the bottom washcoat), which encompassed at least some embodiments having Pt distributions falling within the scope of claim 1 at issue (i.e. those in which the zeolite-containing top washcoat was much thinner than the bottom washcoat). The proposed Pt distribution could therefore be regarded as an attempt to define a selection invention. However, since the defined range had not been associated with any specific effect, it represented an arbitrary selection and could not provide an inventive contribution.

The appellant further indicated in writing that it would be a matter of routine for a skilled person to optimise the amount of Pd in the catalyst. While example 6 of D18 disclosed a Pt/Pd ratio of 3:1, the skilled person would also consider higher proportions such as 10:1 (as proposed in par. [0029]). It was known that Pt was a more effective catalyst and that Pd was only used for the purpose of reducing costs, so using a higher proportion of Pt would represent a trivial consideration.

6.5.2 The Board does not agree with this argumentation for the following reasons:

Despite the fact that D18 recognises the problem of Pd poisoning in the presence of silica, this document addresses this issue by using a silica-free bottom washcoat (see par. [0038] and example 6) and not by reducing (let alone eliminating) the Pd content in the silica-containing top washcoat. While it is true that D18 also contemplates (par [0029], claim 3) Pt/Pd ratios of 2:1 to 10:1, there is no indication that the higher ratios would be preferred and, in any case, there is no teaching that would lead a skilled person to select a zeolite-containing layer substantially free of Pd.

The board is also not convinced that the skilled person would arrive at the Pt distribution defined in claim 1 in an obvious manner. In the board's view, it is not possible to establish a direct comparison between the Pt concentrations in example 6 of D18 (i.e. the Pt volumetric concentrations within each individual layer) and the distribution of the Pt between the layers according to claim 1 (i.e. a relative weight distribution of the Pt between the layers). Contrary to the appellant's arguments, there is no reason to consider the relative thickness ranges proposed in claims 15 and 16 of D18, because these concern the zoned catalyst configuration (i.e. different washcoats zone-coated over a single carrier substrate) defined in claim 10 and not the layered configuration proposed in claim 1 of D18, let alone the specific catalyst of example 6 (which is the actual starting point).

Moreover, the only information which can be derived from example 6 of D18 appears to teach away from the Pt distribution proposed in claim 1 (i.e. to include at least 80% of the Pt in the alumina layer), because the Pt concentration in the top zeolite-containing washcoat (41.3 g/ft^3) is higher than that in the bottom alumina washcoat (32.1 g/ft^3). This is coherent with the purpose in D18 to prevent poisoning of the Pd (and not the Pt) with silica (par. [0038]) while maintaining the catalytic activity of that layer (i.e. the higher amount of Pt in the zeolite-containing washcoat could then be seen as an attempt to compensate for the lower concentration of Pd).

The board therefore considers that a skilled reader starting from example 6 of D18 would not arrive at the subject-matter of claim 1 in an obvious manner.

6.5.3 For the sake of completeness, the board notes that the conclusions would be the same if document D1/D1a were taken as the closest prior art.

In this respect, the appellant argued in writing that claim 1 at issue only differed from example 2 of D1/D1a in the presence of at least some Pt in the zeolite-containing layer (very small amounts were also contemplated in the claim) and in the Pd concentration of 5 to 75 g/ft^3 in the alumina layer. While the Pt concentration in the catalyst of the invention could not be compared with that disclosed in example 2 of D1/D1a, the range defined in claim 1 at issue was conventional and therefore either implicitly anticipated by D1/D1a or, in any case, obvious. These differences had not been associated with any specific technical effect, so the only problem solved by the invention was to provide an alternative catalyst. Such alternative was however not inventive, because D1/D1a disclosed Pt and Pd as alternative noble metals for the catalyst. Furthermore, the proposed concentrations as well as the presence of the Pt in the zeolite-containing layer and the Pt distribution between the layers represented obvious alternatives because they were known from other prior art documents such as D10 (US 2001/053745), D11 (US 5 849 255) or D18.

The board does not agree with these arguments because to arrive at the subject-matter of claim 1 at issue starting from example 2 of D1/D1a the skilled person would need to undertake a significant number of modifications: first, it would need to incorporate Pd to the alumina-containing layer yet not to the zeolite-containing layer, then it would have to consider adding at least some Pt to the zeolite-containing layer, to add an amount of Pt falling within the claimed range of 0.35 to 5.30 kg/m^3, to add an amount of Pd within the defined range of 0.18 to 2.65 kg/m^3 and finally to distribute the Pt between the layers with proportions falling within claim 1 at issue. There is however no incentive in D1/D1a to implement all these measures, in particular considering that none of the 65 preferred examples proposes adding Pt to the zeolite-containing layer or adding Pt and Pd to the alumina layer, and the only reference to a concentration of the noble metals is provided in example 1, which only indicates that the Pt concentration is 0.94% in weight percentage (as indicated in par. [0008]), so that this data cannot be compared with the weight/volume data defined in claim 1 at issue. There is also no incentive for a skilled person to combine D1/D1a with other prior art documents to arrive at the subject-matter of claim 1, because this would entail cherry-picking isolated features from several documents while omitting other accompanying features, a process which would only be considered with the benefit of hindsight.

Consequently, the board considers that the subject-matter of claim 1 would also not be obvious starting from D1/D1a as closest prior art.

7. Since there are no further objections against the allowability of auxiliary request 2, the board has concluded that the patent should be maintained in amended form on the basis of this request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent in amended form based on the claims of auxiliary request 2 filed on 27 August 2019, and a description to be adapted where appropriate.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts ✦ Boards of Appeal of the European Patent Office ✦ Chambres de recours de l'Office européen des brevets

A. Pinna J.-M. Schwaller

Decision electronically authenticated