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Datasheet for the decision of 27 July 2017

Case Number: T 1287/14 - 3.3.05

Application Number: 08728433.7

Publication Number: 2111286

IPC: B01D53/86, C04B38/00, F01N3/28

Language of the proceedings: EN

Title of invention:

GAS CATALYSTS COMPRISING POROUS WALL HONEYCOMBS

Patent Proprietor:

BASF Corporation

Opponents:

Umicore AG & Co. KG Johnson Matthey Public Limited Company

Headword:

Gas treatment article/BASF

Relevant legal provisions:

EPC Art. 54(1), 54(2), 56, 83, 84, 123(2), 123(3)

Keyword:

Amendments - allowable (yes)

Claims - clarity in opposition proceedings

Objection of lack of clarity - admissible (no)

Sufficiency of disclosure - (yes)

Novelty - (yes)

Inventive step - (yes) - closest prior art - document referred to as "closest prior art" vs. specific combination of features referred to as "closest prior art"

Decisions cited:

G 0003/14, T 0888/96, T 0507/98, T 0319/08, T 0099/10

Catchword:



Beschwerdekammern Boards of Appeal Chambres de recours

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Case Number: T 1287/14 - 3.3.05

DECISION
of Technical Board of Appeal 3.3.05
of 27 July 2017

Appellant: BASF Corporation

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Decision under appeal: Decision of the Opposition Division of the

European Patent Office posted on 26 March 2014 revoking European patent No. 2111286 pursuant to

Article 101(3)(b) EPC.

Composition of the Board:

Chairman E. Bendl Members: A. Haderlein

O. Loizou

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Summary of Facts and Submissions

The present appeal lies from the decision of the opposition division to revoke European patent EP 2 111 286. The patent in suit concerns gas catalysts comprising porous wall honeycombs.

II. The opposition division found that claim 1 of the main request underlying the impugned decision met the requirements of Articles 123(2) and 83 EPC. It also held that the main request was not open to an objection of lack of clarity. The subject-matter of claim 1 of the then main request was found to be novel but to lack inventive step in view of

D5: DE 10 2005 062317 A1

D7: US 5 716 899 A.

The auxiliary requests were held to be non-compliant with Article 123(2) EPC.

In the proceedings before the opposition division the following further document was cited:

D11A: translation of JP H09 220423 A.

- III. The proprietor (appellant) lodged an appeal against this decision. With its grounds of appeal, it filed inter alia a main request.
- IV. Under cover of its letter dated 27 June 2017, the appellant filed eight auxiliary requests.
- V. Opponents 1 and 2 (respondents 1 and 2) filed the following documents:

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- D15: Heck, R.M., et al., Catalytic Air Pollution Control, Commercial Technology (Second Edition) 2002, Wiley-Interscience, New York, pages 179 and 180 in addition to pages 134 to 139, 160 to 169, already cited in the opposition proceedings
- D16: Majewksi, W.A., Wall-flow Monoliths, DieselNet Technology Guide, Diesel Filter Materials, Ecopoint Inc., Revision 2005.09b.
- VI. At the oral proceedings before the board, the appellant withdrew its main request and made the first auxiliary request its main request.
- VII. The sole independent claim 1 of this main request reads as follows (amendments to claim 1 of the application as originally filed underlined):
 - "1. A gas treatment article comprising:
 a flow through substrate comprising an inlet axial end,
 an outlet axial end, wall elements having a length
 extending between the inlet axial end to the outlet
 axial end and a plurality of axially enclosed, openended channels defined by the wall elements, the walls
 having a porosity of at least 50% and up to 70%, and an
 average pore size of greater than 30 microns and less
 than 100 microns and the surface of the walls having an
 average roughness defined by open pores on the surface
 of the walls; and
 - a composite catalyst in the form of a washcoat containing particles having an average particle size greater than 3 microns deposited substantially within the wall elements, wherein the washcoat loading is of $\frac{\text{up to } 2.0 \text{ g/in}^3}{\text{o}}$, wherein the average roughness of the surface of the wall elements remains substantially unchanged from prior to loading of the catalyst within

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the walls, and wherein the channels are substantially free of fillets;

wherein a substantial portion of pores are interconnected and extend through the wall elements and the washcoat is located substantially within the interconnected pores."

VIII. The arguments of the appellant, as far as relevant to the present decision, can be summarised as follows:

Claim 1 was based on originally filed claims 1, 2 and 4. The additional features of a lower boundary of 30 microns for the average pore size and a higher boundary of 70% for the porosity were disclosed in combination in the description of the application as filed, in particular in paragraph [0018]. The requirement of Article 123(2) EPC was therefore met.

The requirements of clarity and sufficiency of disclosure were met. The subject-matter of claim 1 was novel over example 1 of D5 because it did not disclose the following features: washcoat loading, unchanged surface roughness, absence of fillets, pore size and particle size in order to solve the posed problem.

The problem to be solved was in particular to reduce back pressure. The proposed solution was not obvious in view of D5, D7 or the other documents cited by the respondents.

IX. The arguments of the respondents, as far as relevant to the present decision, can be summarised as follows:

The main request did not meet the requirement of Article 123(2) EPC. In essence, claim 1 was based on claims 1, 2 and 4 as originally filed, including some

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features from the examples which amounted to cherrypicking certain features while not incorporating other features from the examples.

The claims lacked clarity because of the features "substantially free of fillets" and "substantially unchanged".

The patent did not disclose how "deposition" or "provision" of a coating suspension within the wall elements could be achieved such that the average roughness of the surface of the wall elements remained substantially unchanged from prior to loading the catalyst within the walls. Moreover, the patent did not disclose how a loss in channel area of less than 20% mentioned in paragraph [0094] could be achieved. Also, Figures 5 to 7 suggested that the embodiments according to the invention did not result in a surface roughness that was substantially unchanged from prior to loading. Therefore, the requirement of sufficiency of disclosure was not met.

D5 was novelty-destroying for the subject-matter of claim 1 in view of several passages thereof and in particular in view of example 1 thereof. When construing claim 1, Figure 5 of the patent in suit should be taken into account; it showed that claim 1 also encompassed embodiments wherein fillets were present.

The closest prior art was D5. If the appellant relied on D7 as the closest prior art, starting from that document too there was a lack of inventive step. The distinguishing features did not result in any technical effect. This was evidenced by D15. The proposed solution was obvious in view of D5 alone or in

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combination with any one of D7, D11A and D16.

X. Requests

The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the main request (previously the first auxiliary request) or, in the alternative, on the basis of the claims of one of the first to seventh auxiliary requests (previously the second to eighth auxiliary requests), all requests as filed with letter dated 27 June 2017.

Respondents 1 and 2 requested that the appeal be dismissed.

Reasons for the Decision

- 1. Main request amendments
- 1.1 Claim 1 is based on originally filed claims 1, 2 and 4, i.e. the added features relating to the washcoat loading and to the interconnected pores (cf. last ten lines of claim 1 reproduced in point VII above) are directly and unambiguously disclosed in claims 2 and 4 as originally filed.
- 1.2 What is contentious between the parties is whether the upper boundary of "up to 70%" for the porosity and the lower boundary of "greater than 30 microns" for the average pore size are directly and unambiguously derivable from the application as filed.
- 1.3 These two features are explicitly disclosed in combination in paragraph [0018], last sentence, of the

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application as filed. It is true that this passage says that the contentious features are present "In other embodiments". According to the respondents, only certain features of a particular embodiment were incorporated into claim 1, while other features which were inextricably linked with them were not.

This argument is not persuasive, because even taking the above passage as relating to a specific example, both features thereof, i.e. the lower boundary of the porosity and the upper boundary of the average or mean pore size, are present in claim 1. There is thus no feature which could be considered inextricably linked with the contentious features which has not been incorporated into claim 1.

- 1.4 Moreover, while paragraph [0018] uses the wording "In other embodiments", the skilled person reading this passage would readily construe it as a general disclosure rather than as the disclosure of a specific example of the invention. This is particularly apparent from a comparison of paragraphs [0017] et seq. with the claims as filed, wherein paragraph [0017] corresponds to claim 1, the two first sentences contained in paragraph [0018] corresponds to claims 2 and 3 and paragraph [0019] corresponds to claims 4 to 6.
- 1.5 According to the respondents, the contentious features were inextricably linked with the features contained in the first sentence in paragraph [0018], i.e. relating to the interconnected pores. This argument is however moot since the feature relating to the interconnected pores is now present in claim 1.
- 1.6 The respondents also argued that only in examples 1 and 10 was the washcoat loading in the claimed range, but

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these examples did not include all the features of claim 1.

The board observes that the amendments made are based not on the examples as set out above but on other parts of the application as filed (see points 1.1 to 1.4 above). Therefore, the question of whether or not claim 1 is supported by the examples is in principle immaterial for assessing compliance with Article 123(2) EPC and is rather a question of Article 84 EPC. Moreover, while examples 1 and 10 do not explicitly indicate the average pore size and example 1 does not explicitly indicate the porosity, they also do not indicate any value for these properties that falls outside the claimed range. Thus, these examples are not at odds with the subject-matter of claim 1 and therefore cannot support the respondents' contention that it is not directly and unambiguously derivable from the application as filed.

- 1.7 For the above reasons, the subject-matter of claim 1 is directly and unambiguously derivable from the application as filed.
- 1.8 The same holds true for the dependent claims, which find their basis in the dependent claims as originally filed, and which the respondents have not objected to under Article 123(2) EPC.
- 1.9 Thus, the requirement of Article 123(2) EPC is met.
- 1.10 As claim 1 contains all the features of granted claim 1, the amendments also do not lead to an extension of the scope of protection (Article 123(3) EPC).

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- 2. Main request clarity
- 2.1 The respondents objected to the expressions "substantially free of fillets" and "substantially unchanged" in claim 1 for lack of clarity.
- According to G 3/14 (see order), the claims of the patent may be examined for compliance with the requirements of Article 84 EPC only when, and then only to the extent that, the amendments introduce non-compliance with Article 84 EPC. The contentious features were however already contained in the claims as granted (see claims 1 and 4). The alleged lack of clarity was therefore already present in the claims as granted and thus the amendments cannot be said to have caused it. Therefore, claim 1 is not open to the clarity objection raised by the respondents.
- 2.3 This objection is therefore rejected as inadmissible.
- 3. Main request sufficiency of disclosure
- 3.1 According to the respondents, the patent did not disclose how "deposition" or "provision" of a coating suspension within the wall elements was achieved such that the average roughness of the surface of the wall elements remained substantially unchanged from prior to loading of the catalyst within the walls. In view of the appellant's contention that this feature was not disclosed in D5 but the method for applying the washcoat was a "well known" process within the meaning of paragraph [0070] of the patent in suit, the skilled person could not prepare a gas treatment article within the meaning of claim 1. Moreover, D5 disclosed specifically a process including dipping the substrate in the washcoat slurry, as also taught in paragraph

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[0071] (column 14, lines 22 et seq.) of the patent. The board in this respect also notes that the examples (see for instance paragraph [0081]) were also obtained by dipping.

3.2 The overall teaching of the patent in suit is that comparative honeycombs having a "low" porosity (see comparative example 2, paragraphs [0080] to [0082]; [0088]; Figures 8 and 9) lead to substantial fillets whereas honeycombs having a "high" porosity (see example 1, paragraphs [0080] to [0082]) only lead to minor fillets (see paragraph [0089]), even when the washcoat loading is lower $(1.39 \text{ g/in}^3 \text{ vs. } 1.84 \text{ g/in}^3)$, see paragraph [0082]). In view of the passage in paragraph [0017] teaching that the porosity of the gas treatment article according to the patent is at least 50%, the skilled person, in order to carry out the invention, would readily supplement the porosity value missing from example 1 and prepare honeycombs having a porosity in the claimed range with a washcoat load of for instance 1.84g/in³ (see paragraph [0082]). There is no evidence or any other indication that would suggest that the skilled person, by proceeding as stated, would not arrive at a gas treatment article according to claim 1. The question whether D5 discloses the feature "wherein the average roughness of the surface of the wall elements remains substantially unchanged from prior to loading of the catalyst within the walls" is a matter of novelty and/or inventive step and does not need to be dealt with when examining sufficiency of disclosure. For the sake of argument the board notes however that, while D5 discloses that the washcoat loading could be so low as to only fill the pores, the washcoat loading in the examples of D5 (see paragraphs [0031] and [0036]) is substantially higher (240 and 330 g/l) than the loadings used in the

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examples of the patent in suit (see paragraph [0082]: 1.84 g/in^3 corresponding to 112 g/l; paragraph [0111]: 1.65 g/in^3 corresponding to 100g/l) and than the upper boundary called for in claim 1 (2.0 g/in³ corresponding to 122 g/l). Thus, the disclosure of D5 fails to cast doubt on the sufficiency of disclosure of the patent in suit.

- 3.3 According to another argument of the respondents, it was not possible to achieve a decrease of up to 20% in cross-sectional area as referred to in paragraph [0094] of the patent while still keeping the roughness substantially unchanged. This was particularly apparent when Figures 5 to 7 were compared with Figures 8 and 9.
- 3.4 It is true that in paragraph [0094] it is stated that

"According to embodiments of the invention, the loss in channel area is less than about 20%, for example less than about 10%, specifically less than about 5%, and more specifically less than about 1% of the geometric area of the channel".

It should however be noted that claim 1 does not specify the loss in channel area due to the washcoat. Therefore, the respondents' argument at most amounts to an alleged lack of support of the claims by the description, which is an Article 84 EPC rather than an Article 83 EPC issue, unless the alleged lack of support casts reasonable doubt on the sufficiency of disclosure of the invention. The afore-mentioned passage does not however cast such reasonable doubt, because the skilled person is undoubtedly able to arrive at a gas treatment article according to claim 1 in which the average roughness of the surface of the wall elements remains substantially unchanged (see

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point 3.1 above).

- 3.5 For theses reasons, the requirement of sufficiency of disclosure set forth in Article 83 EPC is complied with.
- 4. Main request novelty
- 4.1 The respondents argued that document D5 was novelty-destroying in view of several passages thereof and in particular in view of example 1 thereof.
- The board observes that, in order to destroy the novelty of the subject-matter of claim 1 of the main request, D5 needs to disclose in combination inter alia values of porosity, average pore size, washcoat loading and average particle size covered by the claimed ranges. The only passage in D5 disclosing a specific combination of these values is example 1 disclosing a porosity of 65%, an average pore size of 22 microns, a washcoat loading of 240 g/l (=3.9 g/in³) and an average catalyst particle size of below 3 microns. Since at least the washcoat loading and the average catalyst particle size are outside the claimed ranges, example 1 of D5 is not novelty-destroying for the subject-matter of claim 1 of the main request.
- 4.3 Concerning the general disclosure of D5, the board observes that it contains washcoat loadings of 10 to 300 g/l (0.16 to 4.9 g/in³) (see paragraph [0008]), a porosity of between 30 and 90% and an average pore size of 10 to 50 microns (see paragraph [0022]). However, even a twofold selection (of 0.16 g/in³ for the washcoat loading and 50 microns for the average pore size) would not lead to subject-matter falling within the boundaries of claim 1, because the general

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disclosure of the porosity (paragraph [0022]) does not disclose a value falling within those boundaries.

- 4.4 Furthermore, in particular in view of paragraph [0035] and Figures 3 and 4 of D5, the feature "the average roughness of the surface of the wall elements remains substantially unchanged..." is not disclosed in D5 in combination with the other features. In particular, paragraph [0035] states that the washcoat loading of 240 g/l used in example 1 of D5 is such that not all the catalyst material is present within the pores of the channel walls. In view of this statement, and Figures 3 and 4 of D5 clearly showing that there is a substantial layer of catalyst material covering the surface of the walls, the afore-mentioned feature cannot be considered to be disclosed in D5.
- 4.5 Likewise, the feature "the channels are substantially free of fillets" is not disclosed in combination with the other features in D5. Figures 3 and 4 relating to example 1 of D5 clearly show substantial fillets in each corner of each channel.

The respondents argued that claim 1 also covered the presence of fillets, as such fillets were shown in Figures 5 and 6 of the patent. This argument is not persuasive, because this claim construction is at odds with the literal wording of claim 1. Moreover, the channels shown in Figures 5 and 6 of the patent contain at most one fillet in only one of the four corners of the channel and therefore can still be said to be "substantially free of fillets", whereas in D5 all four corners of the channel clearly show substantial fillets (see Figures 3 and 4). Therefore, D5 cannot be said to disclose channels "substantially free of fillets".

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- 4.6 Therefore, the requirement of novelty set forth in Article 54(1) and (2) EPC is complied with.
- 5. Main request inventive step
- 5.1 The invention concerns a gas treatment article.
- 5.2 The parties and the board agree that D5 is the closest prior art. The respondents have also submitted arguments for lack of inventive step starting from D7, should the appellant regard the latter document as the closest prior art. As this is not the case, it is not necessary to address inventive step based on D7 as the closest prior art.
- 5.2.1 The respondents were of the opinion that the closest prior art was the disclosure of D5 in its entirety, not a single embodiment such as its example 1. The board agrees with the respondents only insofar as example 1 of D5, when taken as a starting point for assessing inventive step, should not be considered in isolation but rather in the overall context of D5. The specific starting point for assessing inventive step is however normally a set of features disclosed in combination in a document, e.g. an embodiment or example, the latter document being also referred to as "the closest prior art" in a more general sense (see for instance T 888/96, reasons 5, T 507/98, reasons 5.1.1 to 5.1.3; T 319/08, reasons 8.2; T 99/10, reasons 3.2). For assessing inventive step it is therefore necessary to establish the distinguishing features over that specific starting point and to assess whether it was obvious to arrive at the claimed subject-matter when starting from that specific point.

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- 5.2.2 It is common ground that example 1 of D5 discloses neither an average pore size of greater than 30 microns and less than 100 microns nor a washcoat loading of up to 2.0 g/in³. Nor does it disclose either that the average roughness of the surface of the wall elements remains substantially unchanged from prior to loading of the catalyst within the walls or that channels are substantially free of fillets (see point 4.4 and 4.5 above). In this example, the particle size of the washcoat is also below the claimed minimum value of greater 3 microns.
- 5.3 According to the patent in suit, the problem to be solved was *inter alia* the provision of a catalyst composite resulting in minimised back pressure (cf. paragraph [0016]; column 11, lines 3 and 4; lines 19 and 21; column 12, lines 11 to 13; column 21, lines 11 to 14 and lines 17 to 20).
- The patent proposes to solve this problem by a gas treatment article according to claim 1 of the main request, characterised by an average pore size of greater than 30 microns and less than 100 microns, a washcoat loading of up to 2.0 g/in³, an average particle size of the washcoat of greater than 3 microns, the average roughness of the surface of the wall elements remaining substantially unchanged from prior to loading of the catalyst within the walls and the channels being substantially free of fillets.
- 5.5 As to the success of this solution, the respondents argued that no technical effect was caused by the distinguishing features. In particular, the feature relating to the surface roughness did not solve the above problem.

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- 5.5.1 As can be seen in particular from Figure 1 of D5, the cross-sectional area of the channels is substantially reduced by the washcoat loading. Although D5 teaches that the back pressure is substantially lower compared to prior-art catalysts, it is clear from Figure 5 of D5 that the catalysts according to D5 have a substantially increased back pressure profile when compared to the uncoated substrate (Figure 5, lines B and A). In contrast, the gas treatment article according to claim 1 of the main request requires that the average roughness of the surface of the wall elements remains substantially unchanged from prior to loading of the catalyst within the walls, and that the channels are substantially free of fillets. This means that the washcoat layer on the channel walls' surfaces in the gas treatment article according to claim 1 is less thick than in the gas treatment article according to example 1 of D5. This reduced washcoat layer thickness and the substantial absence of fillets translate into an increased cross-sectional area resulting in a decrease in back pressure. For these reasons it is credible that the gas treatment article according to claim 1 leads to minimised back pressure.
- 5.5.2 With reference to D15, the respondents also argued that examples 10 and 11 of the patent did not prove that the subject-matter of claim 1 resulted in an improvement in terms of catalytic activity.

While it is undisputed that examples 10 and 11 of the patent differ in the wall thicknesses, it is clear from the considerations above that decreasing the washcoat loading and thereby increasing the cross-sectional area reduces back pressure.

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- 5.5.3 Thus, the problem is solved by the proposed solution. It is therefore not necessary to reformulate the problem.
- As to obviousness, the respondents argued that the skilled person faced with the problem of minimising back pressure would have reduced the washcoat loading to below 2.0 g/in³, which would have led to a gas treatment article having no fillets and a substantially unchanged average roughness of the channels' surfaces. The further modifications, i.e. the increase in wall porosity and in average particle size of the washcoat, were taught in D5. The solution was also obvious in view of D7, D11A and D16.
- 5.6.1 D5 teaches that a gas treatment article according to example 2 (see paragraphs [0036] and [0037]), i.e. according to example 1 of D5 but with a higher washcoat loading (330 g/l instead of 240 g/l, corresponding to $5.4 \text{ g/in}^3 \text{ instead of } 3.9 \text{ g/in}^3)$, results in decreased pressure drop (see paragraph [0038] and Figure 5). It is therefore questionable whether D5 itself can give any hint to decrease pressure drop even further. But even if Figure 5 were construed as teaching the skilled person to lower the washcoat loading used in example 1 (240 g/l or 3.9 g/in^3), which would show a pressure drop curve below curve B in Figure 5 of D5, and thereby arrive at a pressure drop curve located below curve B and even closer to curve A in Figure 5, there is nothing in D5 that would teach the skilled person trying to solve the problem posed to choose a washcoat loading so low as to arrive at a gas treatment article wherein the average surface roughness remains substantially unchanged from prior to loading of the catalyst within the walls and wherein the channels are

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substantially free of fillets.

- 5.6.2 It is true that there is a passage in D5 teaching that the catalyst material could be incorporated into the pores in its entirety (see paragraph [0017], last sentence), which might be construed as referring to a state wherein the average surface roughness remains substantially unchanged from prior to loading of the catalyst within the walls and wherein the channels are substantially free of fillets. But this passage neither addresses the problem of back pressure nor teaches the washcoat loading required in claim 1. Likewise, although paragraphs [0008] and [0009] do disclose washcoat loadings in the claimed range and address the problem of back pressure (paragraph [0008], last sentence), they do not contain a teaching pointing towards the average surface roughness remaining substantially unchanged from prior to loading of the catalyst within the walls and the channels being substantially free of fillets. What is more, these passages do not contain any teaching with respect to the average pore and particle sizes. Put differently, even assuming that the skilled person, faced with the above problem and starting from example 1, were to reduce the washcoat loading to below 2.0 g/in³, he would have no incentive to increase the average particle size to above 3 microns at the same time.
- 5.6.3 It is undisputed that D5 discloses average particle sizes of greater than 3 microns, i.e. between 3 and 5 microns (see paragraph [0021]). While it is already questionable that the skilled person would have arrived at washcoat loadings of below 2.0 g/in³ (see point 5.6.2 above), the skilled person starting from example 1 of D5 and trying to incorporate the catalyst material into the pores in its entirety would have no

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incentive to increase the average particle size of the catalyst material, because he would expect that at larger average particle sizes it would become more difficult to incorporate the catalyst material into the pores.

- 5.6.4 It was therefore not obvious from D5 alone to arrive at the subject-matter of claim 1 of the main request.
- 5.6.5 D7 does not point to the claimed solution either, because it does not address the problem of back pressure (cf. column 2, lines 12 to 14). As to document D11A, it discloses washcoat loadings within the claimed range (paragraph [0013]) but is silent about surface roughness and fillets. Likewise, the section of D16 dealing with pressure drop (page 30 of 36) mentions neither surface roughness nor fillets and also does not deal with washcoat loadings. In any event, D16 was cited by the respondents only to prove that the average pore and particle sizes called for in claim 1 were known in the prior art, which is not contentious.
- 5.6.6 For the above reasons, the subject-matter of claim 1 and its dependent claims was not obvious in view of the cited prior art.
- 5.7 The requirement of inventive step set forth in Article 56 EPC is therefore met for the main request.

Order

For these reasons it is decided that:

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- 1. The decision under appeal is set aside.
- 2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the claims of the main request (previously the first auxiliary request filed with letter dated 27 June 2017), the figures and an adapted description.

The Registrar:

The Chairman:



C. Vodz E. Bendl

Decision electronically authenticated