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Datasheet for the decision of 7 July 2011

Case Number: T 0705/07 - 3.3.05

Application Number: 02728214.4

Publication Number: 1403231

IPC: C04B 38/00

Language of the proceedings: EN

Title of invention:
Porous ceramic sintered body and method of producing the same and diesel particulate filter

Applicant:
IBIDEN CO., LTD., et al

Opponent:
-

Headword:
Porous sintered body/IBIDEN CO. LTD

Relevant legal provisions:
EPC Art. 84, 111(1)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Clarity: yes, after amendment"
"Remittal for further prosecution"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0705/07 **-** 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 7 July 2011

Appellant: IBIDEN CO., LTD.
1, Kanda-cho 2-chome
Ogaki-shi
Gifu-ken 503-0917 (JP)

Representative: Grünecker, Kinkeldey
Stockmair & Schwanhäusser
Anwaltssozietät
Leopoldstrasse 4
D-80802 München (DE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 7 December 2006 refusing European patent application No. 02728214.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: E. Waeckerlin
Members: H. Engl
D. Prietzel-Funk

Summary of Facts and Submissions

I. The appeal is from the decision of the examining division posted on 7 December 2006. European patent application EP 02728214.4 was refused under Article 84 EPC because claim 1 of the main and auxiliary requests was not clear and because there existed an inconsistency between the examples and the claims.

II. The documents cited in the examination procedure included the following:

D1: US-A-4 632 683
D2: US-A-5 185 110
D3: Hisao Abe *et al., "Preparation and water permeation property of bimodal porous cordierite ceramics"*, J. Ceram Soc. Japan, Int. Edition, (Fuji Technology Press), vol. 100, no. 1, 1999, pages 32 to 36
D4: JP-A-7 215 777
D5: EP-A-1 214 973 (published on 19 June 2002)

III. The examining division essentially argued that:

- The application did not disclose a method for determining the average size of particles in a sintered body of SiC, nor did a standard method for that purpose exist;
- It was to be expected that the SiC particles in the sintered state were irregular in form and, in this case, it was not clear which dimensions should be taken into account for determining the average particle size;
- It was not clear how individual particles of SiC could be identified in the sintered body;
- No clear method was provided for determining the

number of pores at a state of exposing or opening to the surface of the sintered body;
- Furthermore, Example 1 contradicted the claims in that the average particle size of the SiC particles was reported to be smaller than the average pore size of the smaller pores.

IV. The notice of appeal was filed with letter dated 6 February 2007; the grounds for appeal were received under cover of a letter dated 5 April 2007.

V. In a communication dated 24 May 2011 the board issued a provisional opinion and a summons to oral proceedings.

VI. Further submissions of the appellant were received under cover of a letter dated 29 June 2011 and 5 July 2011. In addition, a new set of claims 1 to 16 was filed as the main request replacing the claims previously on file, as well as replacement pages 11, 33 to 35 and 39 of the description and new pages concerning Figures 6 to 8.

VII. The independent claims in accordance with these requests read as follows:

"1. A porous silicon carbide sintered body (20) constituted by silicon carbide particles (23) and having communicated pores constituted by small pores (22) and large pores (21) having a pore size larger than that of the small pores (22), and at least a part of the large pores (21) is existent on a surface of the sintered body (20) at an exposed or opened state, **characterized in that**
the large pores (21) are formed by addition of a pore

forming material (24), the small pores (22) have a size smaller than an average particle size of the silicon carbide particles (23) constituting the sintered body (20), and the number of the large pores (21) existing at a state of exposing or opening to the surface of the sintered body (20) is 10 pores/mm^2 - 100 pores/mm^2."

"11. A method of producing a porous silicon carbide sintered body (20) as claimed in any of claims 1 to 10, comprising at least a preparation step providing a slurry of starting ceramic included the pore forming material (24) for forming the large pores (21), an extrusion shaping step charging the ceramic starting slurry through a mold to obtain a honeycomb shaped body, a firing step subjecting the honeycomb shaped body to drying, firing and degreasing, wherein the pore forming material (24) made of a substance disappearing by heating before the arrival to a sintering temperature of a ceramic is previously added to a green shaped body and then fired, wherein the pore forming material (24) has an average particle size of 30 µm - 80 µm."

"13. A diesel particulate filter, wherein a catalyst (28) is carried on a surface of a ceramic carrier made of a porous silicon carbide sintered body (20) as claimed in any one of claims 1 to 10."

VIII. The appellant essentially argued as follows:

The claimed subject-matter was defined in a clear manner by using the terms "small" and "large" in conjunction with the overall teaching of claim 1 and in relationship to the average particle size. The large

pores were generated through the action of a pore forming agent having a particle size greater than the particle size of the SiC particles. The said particle size of the SiC particles could be determined after sintering by known procedures. The larger pores could be measured by detection in a microscope.

As regarded the discrepancy between the value of 15 µm for the small pores and the average particle size of below 10 µm in the example, this obvious error was removed by deletion of the example and the figures referring to it.

On novelty and inventive step the appellant argued that document D1, disclosing silicon carbide sintered bodies having a special pore size distribution useful as particulate filters in the exhaust system of internal combustion engines, should be regarded as representing the closest prior art.

The object of the invention consisted in providing a porous SiC sintered body having a low pressure loss and high filtering efficiency. This object was attained by the body having small pores of a size smaller than the average particle size of the SiC sintered body, and the number of large pores existing in a state of exposing or opening to the surface of the sintered body being 10 pores/mm^2 to 100 pores/mm^2.

However, D1 neither disclosed a particular size of the small pores with regard to the size of the ceramic particles constituting the sintered body, nor the number of large pores exposed on the surface. Similar arguments applied to D4. D2 and D3 related to sintered

bodies made of cordierite. D5, which was state of the art under Article 54(3) EPC, did not teach the number of large pores in the sintered body and the relation between the average pore size of large pores and small pores.

Therefore, the subject-matter of independent claims 1, 11 and 13 was not only novel, but also involved an inventive step.

IX. Requests:

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims 1 to 16 filed with letter dated 5 July 2011 as the main request, and that the case be remitted to the department of first instance to proceed further with the substantive examination of the case on the basis of the said claims and the application documents adapted thereto.

Reasons for the Decision

1. Amendments

1.1 Claim 1 is based on claims 1 and 2 as originally filed. The feature relating to the presence of a pore forming material for forming the large pores is disclosed for example on page 20, second paragraph, to page 21, second paragraph, and in example 1 of the description. Silicon carbide as a material for the sintered porous body is disclosed throughout the application as originally filed and in claim 2.

Process claim 11 is based on original claims 1 and 2, 12 and 14, and the description, pages 19 to 22; product claim 13 is based on claim 15 as originally filed.

1.2 Dependent claims 2 to 9, 12, and 14 to 16 correspond to original claims 2, 4 to 10, 13 and 16 to 18. Claim 10 is based on a combination of features disclosed in original claims 5, 6 and 3.

1.3 The requirements of Article 123(2) EPC are thus fulfilled.

2. Clarity (Article 84 EPC)

2.1 The examining division's finding in the contested decision that the application did not meet the requirements of Article 84 EPC was based on four distinct objections:

Firstly, the application did not disclose a method for determining the average size of the particles in a sintered body of SiC. No standard method known to the skilled person existed.

Secondly, it was to be expected that the SiC particles in the sintered state were irregular in form. In this case, it was not clear which dimensions should be taken into account for determining the average particle size.

Thirdly, it was not clear how individual particles of SiC could be identified in the sintered body.

Lastly, Example 1 contradicted the claims in that the

average particle size of the SiC particles was reported to be smaller than the average pore size of the smaller pores, contrary to the requirement of claim 1.

2.2 In view of the submissions of the appellant, the board finds that these objections are no longer tenable having regard to the amended claims, description and drawings, for the following reasons.

2.2.1 It is evident from the SEM microphotograph of Figure 6b of the application as originally filed that the pore size of the large pores (formed by the aid of a pore-forming agent) may readily be determined by, for example, visual inspection, as is indicated on pages 33 and 34 of the description. This was not disputed in the contested decision. Moreover, it is clear that the pore size of the large pores reflects the particle size of the pore forming agent, which is known as such and may be determined by standard methods. Claim 1 as amended indeed states that the large pores are formed by the addition of a pore forming material, and the description, page 22, lines 18 to 20 clearly states that the large pores correspond approximately in form and size to the pore forming material.

2.2.2 Concerning the determination of the pore size of the small pores, required by claim 1 to be smaller than the average particle size of the SiC particles making up the sintered body, the appellant's argument is that in principle the same method of SEM microphotography may be used. The board has no reason to call this into question, although the degree of detail given in the SEM microphotograph of Figure 6b is not sufficient to support the statement. More importantly, according to

the claim's language it is in fact sufficient to make sure that the pore size of the smaller pores be smaller than the average pore size of the SiC particles making up the sintered porous body of SiC. The average particle size of the SiC particles can be determined from the micrograph. The board also accepts the appellant's argument that the said particle size can be estimated to a considerable extent from the average particle size of the initially used SiC powder which should generally be known to the skilled experimenter. This can be done because individual particles of SiC remain separate and discernible even after the sintering step, the particles only being connected through "necks" (see description, page 34, lines 11 to 14). It should be borne in mind that in order to produce a sintered SiC porous body having the claimed pore size and pore distribution so as to be suitable for a filter for particulate matter and for a catalyst carrier, the skilled person would conduct the sintering step under conditions leading only to a low degree of densification of the sintered body. In fact, the substantially porous nature of the sintered body in accordance with the application is shown in schematic Figures 5a and 5b and in SEM photography 6b. In Table 1, example 1, of the application as filed, a porosity of 50% is reported.

2.2.3 As regards the allegedly irregular shape of the sintered SiC particles, the board is satisfied that the average value of the particle size can be determined by measuring a plurality of particles and/or by taking cross-sections at several positions.

2.2.4 Since example 1 has been deleted, the objection of a discrepancy between claims and example has been rendered moot.

2.3 No other objection under Article 84 EPC has been raised in the contested decision or is apparent to the board. The board therefore concludes that the claims of the main request satisfy the requirements of Article 84 EPC.

3. Remittal

3.1 The examining division has not formed an opinion on the question of novelty and inventive step having regard to the available prior art. Therefore, and in view of the appellant's own request, the board decides to exercise its discretion under Article 111(1), second sentence, EPC to remit the case for further examination.

3.2 To avoid any misunderstanding, the board wishes to add that this decision does not bind the examining division to the particular version of the description as filed with appellant's letter of 5 July 2011 and underlying the present decision. The amendments to the description, in particular the deletion of example 1, have been proposed by the appellant in order to remove an obvious inconsistency existing between the claims and the text of the example with respect to the size of the small pores in relationship to the average particle size of the SiC particles. It is understood that in the course of further examination subsequent amendments to the claims may become necessary which entail corresponding amendments to the description and/or the drawings. The competence and responsibility for examining such amendments lies with the examining division.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance for further examination.

The Registrar The Chairman

C. Vodz E. Waeckerlin