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**Datasheet for the decision  
of 4 May 2018**

**Case Number:** T 0378/15 - 3.3.03  
**Application Number:** 07844717.4  
**Publication Number:** 2087031  
**IPC:** C08K3/22, C08K7/10, C08K9/02,  
C08K9/04, C08K9/06, B29C67/00  
**Language of the proceedings:** EN

**Title of invention:**

POWDER COMPOSITIONS AND METHODS OF MANUFACTURING ARTICLES  
THEREFROM

**Patent Proprietor:**

3D Systems, Inc.

**Opponents:**

Evonik Degussa GmbH  
EOS GmbH Electro Optical Systems

**Relevant legal provisions:**

RPBA Art. 12(4), 13(1), 13(3)  
EPC Art. 54, 56

**Keyword:**

Novelty - (yes)  
Inventive step - obvious alternative (main and auxiliary  
requests 1 to 13)



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

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Case Number: T 0378/15 - 3.3.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 4 May 2018**

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**Decision under appeal:**

**Interlocutory decision of the Opposition**  
**Division of the European Patent Office posted on**  
**5 January 2015 concerning maintenance of the**  
**European Patent No. 2087031 in amended form.**

**Composition of the Board:**

**Chairman**            D. Semino  
**Members:**            F. Rousseau  
                              C. Brandt

## **Summary of Facts and Submissions**

- I. The appeals by the patent proprietor and opponents 1 and 2 are against the interlocutory decision of the opposition division posted on 5 January 2015 according to which European patent No. 2 087 031 as amended according to the documents of auxiliary request 7 submitted on 19 November 2014 during the oral proceedings met the requirements of the EPC. The decision was also based on a main set of claims and six auxiliary requests submitted with letter of 20 October 2014.
- II. Claims 1 of the requests underlying the contested decision were as follows:

### *Main request (claims as granted)*

"1. A powder composition comprising:

at least one laser-sinterable polymer powder, and at least about 3 weight percent of reinforcing particles having an aspect ratio of at least about 5:1 and a maximum dimension of less than about 300 microns, based on the total weight of the powder composition; wherein at least a portion of the reinforcing particles are mineral particles that comprise at least about 1 wt-% of the powder composition, based on the total weight of the powder composition."

### *Auxiliary request 1*

The wording of claim 1 of auxiliary request 1 differed from that of claim 1 of the main request in that it contained at the end of the claim the feature "and

wherein the reinforcing particles have a maximum dimension of greater than about 10 microns."

*Auxiliary request 2*

Compared to claim 1 of auxiliary request 1 claim 1 of auxiliary request 2 defined in addition the maximum amount of reinforcing particles being mineral particles to be less than 40 wt-% of the powder composition.

*Auxiliary request 3*

Compared to claim 1 of auxiliary request 2 claim 1 of auxiliary request 3 specified that the mineral particles are selected from silicate minerals, calcium minerals, barium minerals, magnesium minerals or combination thereof.

*Auxiliary request 4*

Claim 1 of auxiliary request 4 corresponded to claim 1 of the main request in which the mineral particles were defined to comprise wollastonite.

*Auxiliary request 5*

Claim 1 of auxiliary request 5 corresponded to claim 1 of the main request in which the reinforcing particles were defined to have a maximum dimension of greater than about 10 microns and to comprise wollastonite.

*Auxiliary request 6*

Claim 1 of auxiliary request 6 corresponded to claim 1 of auxiliary request 5 in which the maximum amount of reinforcing particles being mineral particles was

defined to be less than 40 wt-% of the powder composition.

*Auxiliary request 7*

Claim 1 of auxiliary request 7 corresponded to claim 1 of the main request in which at least some of the reinforcing particles were defined to be acicular.

III. A further auxiliary request 8 had been submitted with letter of 20 October 2014 whose claim 1 corresponded to claim 1 of the main request in which the reinforcing particles were defined to have a maximum dimension of greater than about 10 microns and to comprise acicular wollastonite particles.

IV. The decision was taken having regard to the following documentary evidence amongst others:

E1: Ullmanns Encyklopädie der technischen Chemie, 4th Edition, Volume 11, pages 359-360

E11: WO 2005/090449 A1

E12: US 2004/0175686 A1

E20: Römpps Online, entry for "Mineralfasern", 19 November 2014.

V. According to the contested decision the invention as defined in the patent as granted met the requirement of sufficiency of disclosure, did not extend beyond the content of the application as filed and was novel *inter alia* over E11 as carbon fibers were not mineral fibers as shown in E20. The problem solved over E11 representing the closest prior art was the provision of an alternative powder composition. Faced with that problem the skilled person would have found obvious to use wollastonite which was cited in E12 as a mineral

suitable for laser sintering applications. Therefore, the subject-matter of claims 1 to 18 was held to lack an inventive step. Based on the same reasoning the subject-matter of claims 1 of auxiliary requests 1 to 6 lacked an inventive step. Regarding auxiliary request 7 the additional feature in claim 1 that at least some of the reinforcing particles were acicular did not result in a different formulation of the problem solved over E11, but an inventive step was acknowledged, since the cited prior art did not suggest to use reinforcing particles in acicular form in laser sintering applications.

VI. Appeals against that decision were lodged by the patent proprietor and by the opponents.

VII. Opponents 2 and 1 submitted with their statements of grounds of appeal (letters dated 5 May 2015 and 12 May 2015, respectively) *inter alia* the following documents:

A1: <http://de.wikipedia.org/wiki/Wollastonit>  
25 April 2015 (labelled "Enclosure 1")

A2: [http://en.wikipedia.org/wiki/Acicular\\_\(crystal\\_habit\)](http://en.wikipedia.org/wiki/Acicular_(crystal_habit)) 25 April 2015 (labelled "Enclosure 2")

A4: [http://fr.wikipedia.org/wiki/Fibre\\_de\\_carbone](http://fr.wikipedia.org/wiki/Fibre_de_carbone)  
27 April 2015 (labelled "Enclosure 4")

A5: [http://en.wikipedia.org/wiki/Nylon\\_12](http://en.wikipedia.org/wiki/Nylon_12) 27 April 2015  
(labelled "Enclosure 5")

E23: "Developments in plastics technology - 3", edited by A. Whelan and J. L. Craft, New York, 1986, Chapter 4, pages 119-137 "Acicular Wollastonite as a filler for polyamides and polypropylene"

E25: Römpp-Chemie-Lexikon, 9th Edition 1992, pages 2288-2289

VIII. The patent proprietor filed with their statement of grounds of appeal (letter dated 15 May 2015) the following documents:

A6: Experimental report (labelled Annex A)

A7: Data Sheet of FILLEX®2-AH3/FILLEX®7-AE-1

A8: Römpf-Chemie-Lexikon, 10th Edition 1998, page 2697,

as well as additional auxiliary requests 9 to 13 whose claims 1 contained the following amendments:

*Auxiliary request 9*

Claim 1 of that request corresponded to claim 1 as granted wherein the at least one polymer powder was defined to be selected from the group consisting of "a polyamide, a polyester, a polyolefin, a polyetherketone, a polyurethane, a polyvinyl acetate, a polymethacrylate, a phenolic, an ionomer, a polyacetal, an acrylonitrile-butadiene-styrene copolymer, a polyimide, a polycarbonate, and a mixture thereof".

*Auxiliary request 10*

The wording of claim 1 of auxiliary request 10 was identical to the wording of claim 1 of auxiliary request 9 except that polyetherketone was not enumerated in the list of polymer powder.

*Auxiliary requests 11 and 12*

Claims 1 of those requests corresponded to claim 1 as granted wherein the at least one polymer powder was defined to be a polyamide for auxiliary request 11 and to be selected "from the group consisting of



nylon-6,10; nylon-6,12; nylon 6,13; nylon 8,10; nylon 8,12; nylon 10,10; nylon 10,12; nylon 12,12; nylon-11; nylon-12; and a mixture thereof" for auxiliary request 12.

*Auxiliary requests 13*

Claim 1 of that request corresponded to claim 1 of auxiliary request 12 with the additional restriction that the mineral particles comprised wollastonite.

IX. Opponents 1 and 2 submitted with their rejoinders (letters dated 14 September 2015 and 29 September 2015, respectively) *inter alia* the following documents:

E27: Data Sheet of Wollastonite NYAD G® IN-072-05-2  
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E28: Industrial Minerals & Rocks, edited by Jessica Elzea Kogel, published by the Society for Mining, Metallurgy, and Exploration, Inc., 2006, pages 1027-1037

A9: Data Sheet of Toho Tenax, Teijin, 14 March 2014

X. Following the submission of their rejoinder with letter of 26 November 2015, the patent proprietor filed with letter of 16 February 2017 *inter alia* the following document:

A14: Declaration of Mr. Böhler

XI. A communication of the Board of 4 April 2018 sent in preparation of oral proceedings was issued.

XII. The patent proprietor submitted on the same day an additional auxiliary request 6A, whose claim 1 compared to auxiliary request 6 apart from the deletion of the

various occurrences of the term about specified the amount of laser-sinterable polymer powder to be from 20 weight percent to less than 97 weight percent, based on the total weight of the powder composition and the amount of reinforcing particles having the dimensions specified in claim 1 of auxiliary request 6 to be less than 80 weight percent.

- XIII. The patent proprietor submitted with letter of 2 May 2018 an additional experimental report A18.
- XIV. The oral proceedings before the Board took place on 4 May 2018.
- XV. As far as relevant to the present decision, the submissions of the patent proprietor can be summarized as follows:

*Admittance of items of evidence*

- (a) A18 had been filed in response to remarks in the Board's communication in respect of experimental report A6. The amount of data presented with A18 was limited and the results shown merely confirmed the submissions of the patent proprietor, in particular on the basis of declaration A14, the argumentation presented being the same since the beginning of the appeal proceedings. Hence, A18 which demonstrated a significant improvement also with uncoated wollastonite should be admitted into the proceedings.
- (b) Documents A1, A2, A4, A5, A9, E23, E25, E27 and E28 should be not admitted into the proceedings. Those documents were late filed and did not provide any information that went beyond the content of the

documents which were already on file. In addition, documents A1, A2, A4 and A5 were excerpts of Wikipedia which could not be regarded as reliable source for scientific information.

*Admittance of auxiliary requests*

- (c) As to auxiliary request 6A it had been submitted in response to the newly raised irrationally broad interpretation by the opponents of the wording of claim 1 as granted.

*Novelty over E11*

- (d) E11 related to powder compositions for use in the production of three-dimensional articles using layered manufacturing such as laser sintering, which compositions could comprise reinforcing fibers such as carbon fibers, which carbon fibers were not mineral fibers as shown in A8 and E20. As was obvious from the definition of mineral fibers in paragraph [0018] of the patent in suit, taking into account the whole content of the contested patent, in particular the indication in paragraph [0004] of drawbacks of carbon fibers and the expressed need for their replacement, as well as examples of mineral particles given in paragraph [0052], the expression "mineral fibers" was not intended to cover carbon fibres. The term "equivalents" used in paragraph [0018] only meant synthesized, i.e. man-made products, corresponding to the products occurring in the nature. Accordingly, novelty was given over E11.

*Inventive step*

- (e) The closest prior art was represented by the disclosure of E11, from which the powder composition of claim 1 differed by the presence of mineral particles having the dimensions specified therein.

The problem solved by the claimed powder composition over those of E11 was in line with paragraphs [0004] and [0005] of the specification the provision of powder compositions for the production of articles by laser sintering having comparable mechanical properties, but without the need to use carbon or glass fibers. As had been shown with A6, taking A14 into account, the dimension of the reinforcing mineral particles had been specifically chosen with a view to achieve suitable mechanical properties, in particular brittleness, of the articles produced by laser sintering of the claimed powder. Moreover, the dimension of the reinforcing fibres as selected in operative claim 1 resulted in a better orientation of the fibres and less undesired anisotropy in respect of tensile strength.

None of the cited references provided the person skilled in the art with a hint that the specific mineral particles used in claim 1 would lead to such an effect. E11 recommended the use of carbon fibers or glass fibers, and the skilled person would not find any motivation to replace those by mineral fillers in a situation where glass or carbon fibres were required, let alone with the particular advantageous dimension defined in operative claim 1. E12, even if it mentioned the

use of wollastonite, indicated that the preferred filler were glass beads. E23 did not give any hint that wollastonite could be employed in laser sintering applications, but merely taught its use for injection moulding. Hence, replacing the carbon fibres in E11 by wollastonite, when E11 taught the use of carbon fibres and E23 only described the use of wollastonite for injection moulding application could only be arrived at on the basis on an inadmissible hindsight knowledge of the present invention. Furthermore, wollastonite had several advantages versus carbon fibres in terms of handling, safety, density resulting in lower loading volumes and brightness of the obtained articles.

The subject-matter of claim 1 involved therefore an inventive step.

- (f) Regarding inventive step of the subject-matters defined with the auxiliary requests the same arguments as for the main request applied, in particular in respect of the definition of the problem solved by the claimed subject-matter over the disclosure of E11 as closest prior art. Having regard to the additional features contained in those requests, it would be more difficult for the skilled person to come up with the solution proposed therein, which in any event was not suggested by the state of the art.

XVI. As far as relevant to the present decision, the submissions of the opponents can be summarized as follows:

*Admittance of items of evidence*

(a) A18 had not been only submitted extremely late, but in addition did not contain any information about the wollastonite used, so that it was impossible for the opponents to analyse and verify the new comparative test submitted therewith. In addition, it was not justified to submit A18 at this stage of the proceedings since the objection concerning the lack of relevance of the comparative test A6 had been raised by the opponents long before the Board's communication. Hence, A18 should not be admitted into the proceedings. Documents A1, A2, A4, A5, A9, E23, E25, E27 and E28 had been submitted in response to auxiliary request 7 submitted shortly before the oral proceedings before the opposition division or in response to evidence and arguments submitted by the patent proprietor on appeal. Those documents should therefore be admitted into the proceedings.

*Admittance of auxiliary requests*

(b) Auxiliary requests 9 to 13 should not be admitted into the proceedings, because they were directed to subject-matters diverging from the auxiliary requests submitted before the opposition division and auxiliary requests 6A should also not be admitted because it was filed only one month before the oral proceedings without any justification for doing so.

*Novelty over E11*

- (c) The only feature which could distinguish the powder composition in accordance with claim 1 of the main request from the powder composition disclosed in Embodiment 2 of E11 comprising 10 volume-%, i.e. 16.6 wt.-%, of carbon fibres was that at least a portion of the reinforcing particles were mineral particles. Carbon fibres, i.e. graphite fibres, however, were in view of document E25 to be considered as mineral fibres. Moreover, following the jurisprudence of the Boards of Appeal, the patent should be its own dictionary, which meant that the term "mineral" had to be interpreted in the light of the definition given in paragraph [0018] of the specification and therefore encompassed synthetically-produced equivalents of naturally-occurring minerals. On that basis the term "mineral" included graphite, in particular as the patent in suit did not define how the term "equivalents" was to be understood. Accordingly, claim 1 lacked novelty over Embodiment 2 of E11.

*Inventive step*

- (d) The closest prior art was represented by the disclosure of E11, in particular its Embodiment 2. The definition of operative claim 1 did not exclude the use of mineral fibers in combination with carbon or glass fibers, this embodiment of the present invention being explicitly described in paragraph [0048] of the specification. Having regard to the dimension and amount of the carbon fibers used in Embodiment 2 of E11, the sole feature distinguishing the powder composition of operative claim 1 from the closest prior art was

therefore that 1 wt-% of the powder composition were mineral fibers. Those could be present either in replacement of some carbon fibers used in E11 or in addition thereto.

Contrary to the allegation of the patent proprietor, it had not been shown that this distinguishing feature lead to any technical effect. No experimental evidence had been submitted which showed that the replacement of some fibers used in E11 by any mineral particle or the addition thereto of some mineral particles in the amounts defined in claim 1 would lead to the alleged effect over the whole scope of claim 1. In addition, A6 which was meant to show the influence of the maximum dimension of the reinforcing particles, was not relevant, as that feature did not represent the feature distinguishing the claimed composition from the closest prior art. In addition the comparison offered with A6 in order to show the influence of the maximum dimension of the reinforcing particles was not suitable to demonstrate any effect, since it had been made with particles which differed also in further aspects, namely presence of a silane coating and the composition of the wollastonite itself, as shown by E27 describing NYAD G® used for the comparative example of A6 and by A7 describing FILLEX® 2-AH3 used for the example of A6. Declaration A14 according to which the silane coating on the wollastonite did not result in differences in the sintered parts was in contradiction with the common general knowledge in the art illustrated in particular by document E23. Moreover, even the composition used as comparison in A6 which did not lead to the effect sought was in fact a composition in accordance with operative



claim 1. Furthermore, any effect concerning the anisotropy of mechanical properties allegedly demonstrated by A6 was not addressed in the patent in suit and therefore could not be taken into account for the formulation of the problem solved over the closest prior art. For all these reasons, the problem solved over the closest prior art by the compositions of operative claim 1 could only be formulated as the provision of an alternative powder suitable for laser sintering.

E12 described the use of wollastonite as reinforcing filler for producing articles by laser sintering. E23 concerned the use of acicular wollastonite, in particular of silane coated acicular wollastonite with an aspect ratio between 10:1 and 20:1, as reinforcing material for polyamide. According to the second last paragraph before section 4.3 on page 125 of that document, the presence of wollastonite, either coated or uncoated, did not cause a significant change in the degree of crystallinity of polyamide 6, the glass transition also remaining unchanged. The reason why E23 concerned the production of articles by injection moulding, but not by laser sintering, was simply that the latter technology had not been yet developed at the publication date of E23. However, E11 in the third paragraph of page 16 indicated that the properties of polyamide 12 articles reinforced with fibres were not worsen when using laser sintering instead of injection moulding. Also E11 suggested with claim 2 to replace carbon or glass fibers by other fibers. Hence, the skilled person would consult E23 and use an acicular wollastonite with an aspect ratio between 10:1 and 20:1 in the composition described in E11 arriving

in an obvious manner at the composition of operative claim 1. Other advantages advanced by the patent proprietor, i.e. that wollastonite was less expensive than glass fibers and would allow to achieve brighter articles compared to the use of carbon fibres were well known to the skilled person and could not support the existence of an inventive step. Hence, claim 1 of the main request lacked an inventive step.

The same argumentation as in respect of claim 1 of the main request was valid for claims 1 of the auxiliary requests, whose additional features did not necessarily constitute a further distinguishing feature over the closest prior art and/or did not result in a different problem solved over it and moreover were known from the documents cited in respect of the main request. Hence, none of the compositions according to claim 1 of the auxiliary requests met the requirement of Article 56 EPC.

XVII. The patent proprietor requested that the decision under appeal be set aside and the patent be maintained as granted, or alternatively that the patent be maintained on the basis of any of auxiliary requests 1 to 6, all submitted with letter of 20 October 2014, or on the basis of auxiliary request 6A submitted with letter dated 4 April 2018, or on the basis of auxiliary request 7 submitted on 19 November 2014 during the oral proceedings before the opposition division, or on the basis of auxiliary request 8 submitted with letter of 20 October 2014, or on the basis of any of auxiliary requests 9 to 13, all submitted with letter of 15 May 2015.

XVIII. Opponent 1 and opponent 2 requested that the decision under appeal be set aside and that the European patent No. 2 087 031 be revoked.

## **Reasons for the Decision**

### *Admittance of items of evidence*

1. Document A1, A2, A4 to A9 and E23, E25, E27 and E28 were all submitted with the statements of grounds of appeal or replies to them. The admission to the proceedings is left to the power of the Board pursuant to Article 12(4) RPBA.
- 1.1 A first version of auxiliary request 7 on the basis of which the patent in suit was maintained in accordance with the contested decision had been submitted in a group of eight auxiliary requests filed only one month before the oral proceedings, which represented the first attempt to submit amendments of the granted patent. That first version was, to the exception it did not include the modification of dependent claim 8, identical to the one maintained. The modification that the reinforcing particles were acicular as defined in auxiliary request 7 was not a feature of the claims as granted, so that the filing of E23 and E28 dealing with the use of acicular wollastonite as reinforcing material for polyamides represents a timely and appropriate submission in response to the late filing of auxiliary request 7 before the opposition division and the submissions of the patent proprietor in their statement of grounds of appeals that the use of acicular reinforcing particles was not suggested by the prior art.

- 1.2 A8 and E25 are excerpts of an encyclopedia showing the meaning of the terms "mineral fibers", "carbon" and "carbon fibers" used in the patent in suit or in the prior art documents alleged to be novelty destroying. The submissions of those documents to merely elucidate the meaning attributed to those terms by the skilled person at the date of filing or priority of the patent in suit is reasonable and does not delay the proceedings in any way.
- 1.3 Experimental report A6 submitted by the patent proprietor is meant to show the advantages of using mineral particles having a maximum dimension of less than 300  $\mu\text{m}$  or of using wollastonite fibers over carbon fibers. It can be therefore considered to be in response to the finding of the opposition division that no effect had been shown to be obtained over the powder composition described in E11. A7 is a data sheet about the commercial product FILLEX® 2-AH3, i.e. a document explaining the nature of the mineral particles used in the examples of the patent in suit which are also employed in A6. The admissibility of A6 and A7 has not been challenged by the opponents and the Board has no reason to take a different view.
- 1.4 E27 and A9 were submitted in direct response to the experimental data A6 filed by the patent proprietor on appeal. They provide structural information on the specific wollastonite filler and the carbon fibers used by the patent proprietor in the comparative examples of A6. E27 and A9 in particular provide missing information required to determine whether the technical effect allegedly shown in A6 can be attributed to one of the features of present claim 1, namely the maximum dimension of the reinforcing particles or the use of mineral particles. Hence, the filing of E27 and A9

constitutes an appropriate and timely response to the filing of A6 by the patent proprietor.

1.5 Accordingly, the Board has no reason to make use of its discretionary power under Article 12(4) RPBA and to hold documents A6 to A9, E23, E25, E27 and E28 as inadmissible. As a consequence these documents are in the proceedings.

1.6 A1, A2, A4 and A5 are extracts of Wikipedia cited by opponent 2 in order to demonstrate the meaning to be attributed to certain terms contained in claim 1 as maintained by the opposition division (A1 and A2) or to analyse the disclosure of embodiment 2 of E11 regarding the amount of carbon fibers contained in the composition described therewith. However, the reliability of the information contained in these specific articles of Wikipedia cannot be assessed and/or there is no evidence that the content of those documents was made available to the public before the effective date of filing of the patent in suit. Accordingly, and independently from the question whether or not there was any justification to submit those documents on appeal, those documents cannot be used to prove common general knowledge available at the effective date of the patent in suit and therefore cannot be held to relate in its broadest sense to the case under appeal. Accordingly, the Board makes use of its discretionary power under Article 12(4) RPBA to hold documents A1, A2, A4 and A5 as inadmissible.

2. Documents A14 and A18 were submitted after the reply of the parties within the meaning of Article 12(2) RPBA and their admission to the proceedings is therefore subject to the Board's discretion pursuant to Article 13(1) RPBA.

- 2.1 A14 is a declaration submitted in response to the argument by the opponents that the comparison offered with A6 cannot demonstrate any technical effect arising from the feature distinguishing the claimed compositions from those disclosed in the closest prior art, since the comparison offered also differed in a further feature, namely the presence of a silane coating. It follows therefore that the filing of A14 is the result of normal developments in the appeal proceedings so that the Board finds it appropriate to exercise its discretion by admitting it into the proceedings (Article 13(1) RPBA).
- 2.2 A18 is an additional experimental report submitted by the patent proprietor two days prior to the oral proceedings, which concerns the measurement of the same mechanical properties as in A6, but in respect of an uncoated wollastonite. According to the patent proprietor its purpose is to confirm the arguments brought forward in their prior submissions, in particular in view of A14, that the coating of a silane agent on the wollastonite fibers used in the example according to the patent in suit in experimental report A6 does not have any influence of the mechanical properties tested, i.e. in other words that A6 is suitable evidence for the effect alleged to be achieved over the closest prior art. However the argument of the patent proprietor that the submissions based on A18 could not take the opponents by surprise and were in response to the Board's comments in its communication expressing concerns about the persuasiveness of A6 do not constitute any justification for their late filing. The criticism exercised by the Board with respect to A6 in its communication stemmed from exactly the same objection as raised by the opponents in their written submissions as early as with letter of

14 September 2015 of opponent 1 (point 1.3, first full paragraph of page 8) and with letter of opponent 2 of 29 September 2015 (point iii) starting at page 9). Accordingly, the patent proprietor should not have waited until two days before the oral proceedings and more than two years after said submissions of the opponents to file experimental data A18, but submit it in a timely manner to allow the opponents sufficient time to provide a response thereto. While the Board does not find any justification for the late filing of A18, its admittance would also put the opposing party in the position of not being able to properly reply to it without adjournment of the oral proceedings. On this basis, the Board does not admit document A18 into the proceedings (Article 13(1) and 13(3) RPBA).

*Novelty over E11*

3. E11 defines in claim 8, which refers to claims 6 and 7 dependent on claim 2, a powder composition suitable for selective laser sintering which comprises a polymer powder such as Polyamide 11 or Polyamide 12 and carbon and/or glass fibers as reinforcing material. An example of such powder composition is described in embodiment 2 of E11 (page 15, line 23 - page 16, line 34), whose disclosure is seen by the opponents to anticipate the subject-matter of granted claim 1.
- 3.1 That embodiment 2 describes in accordance with figure 4 a mixture of a powder of Polyamide 12 with a grain size distribution width d50 of about 50 microns and 10 volume% carbon fibers of two different types with an average fiber length L50 of about 70 microns and a fiber thickness of 7 microns. It is undisputed that the mixture employed in embodiment 2 of E11 is disclosed through the use of the above described carbon fibers to

contain at least about 3 weight percent of reinforcing particles having an aspect ratio of at least about 5:1 and a maximum dimension of less than about 300 microns, based on the total weight of the powder composition. The sole issue in dispute concerning novelty over E11 is whether the definition in operative claim 1 that "at least a portion of the reinforcing particles are mineral particles that comprise at least about 1 wt-% of the powder composition, based on the total weight of the powder composition" constitutes a distinguishing feature over embodiment 2 of E11. The opponents submitted in this respect that the term mineral cannot confer any novelty to operative claim 1 as that term, within the meaning of the patent in suit also covers the type of carbon of which are made carbon fibers used in embodiment 2 of E11.

- 3.2 The excerpts of technical encyclopedia E1 or technical lexicon A8 demonstrate that carbon fibres at the relevant date of filing of the patent in suit were not classified by the skilled person as mineral fibers. This also is not contradicted by the definition of the term "mineral" provided in paragraph [0018] of the patent in suit, namely *"any of the genus of naturally occurring inorganic substances (including fossilized organic substances) that typically have a definite chemical composition and a characteristic crystalline structure, color, or hardness. The term encompasses both purified minerals and synthetically-produced equivalents of naturally-occurring minerals"*, because no evidence was provided showing that the characteristics of carbon fibers also called graphite fibers (see E25, page 2289), let alone those used in E11, corresponded to those of naturally-occurring graphite. The opponents further argued that the term "equivalent" in the definition given in paragraph



[0018] was vague so that the term mineral within the meaning of the patent in suit would also include man-made graphite whose characteristics resemble those of naturally-occurring graphite.

3.3 However, it is constant jurisprudence (Case Law of the Boards of Appeal of the EPO, 8th edition, 2016, e.g. I.C.4.1) that a term as used in a document has to be construed in the context of the document taken as a whole and not in isolation. In the present case, even if one took the position that the term "equivalent" taken alone could designate products whose characteristics resemble the products naturally occurring, one would understand having regard to paragraphs [0004] and [0050] of the specification describing the drawbacks of carbon (graphite) fibers and the need to reduce or eliminate their use by the use of mineral particles that the term "equivalent" used in paragraph [0018] is not meant to allow the wording "mineral particles" to include carbon fibers.

3.4 Accordingly, the objection that embodiment 2 of E11 would anticipate granted claim 1 fails to convince.

*Inventive step*

*Closest state of the art*

4. The patent in suit concerns Laser Sintering (LS) technology (also called selective laser sintering) for which carbon fibers and glass fibers have been considered as filler materials to improve the mechanical properties of LS articles (see paragraphs [0001] to [0004] of the patent in suit). In view of drawbacks linked to the use of carbon or glass fibers which are recited in paragraph [0004], in particular

their costs, the patent in suit has the objective to provide improved powder compositions for use in producing LS articles that exhibit suitable mechanical properties at ambient and/or elevated temperatures (see paragraph [0005]) .

4.1 All parties in line with the contested decision argued inventive step starting from the disclosure of E11, in particular from the powder composition of embodiment 2 of that document described in above section 3.1. Having regard to the objective of the patent in suit to improve powder compositions for use in producing LS articles, in particular those comprising glass or carbon fibers, and as indicated in the Board's communication, the undisputed finding that the other prior art documents cited in the proceedings do not come closer to the present invention than E11, the Board is satisfied that E11 represents a suitable starting point for assessing inventive step.

4.2 It follows from the analysis given in respect of novelty over E11 that the powder composition of operative claim 1 differs from those disclosed in E11, only in that it contains at least 1 wt-% based on the total weight of the composition of mineral reinforcing particles having an aspect ratio of at least about 5:1 and a maximum dimension of less than about 300 microns. Having regard the wording of present claim 1, the mineral reinforcing fibers can be used in the absence of or in combination with carbon fibers, as confirmed by paragraph [0050] of the specification.

*Problem successfully solved*

5. Having regard to the disclosure of E11, the patent proprietor submitted that the technical problem solved

by the subject-matter of claim 1 of the patent in suit was the provision of powder compositions for use in producing LS articles exhibiting comparable mechanical properties without the need to use carbon or glass fibers. That problem is alleged to be solved by the use of at least 1 wt-% based on the total weight of the composition of mineral reinforcing particles having an aspect ratio of at least about 5:1 and a maximum dimension of less than about 300 microns, which constitutes the feature distinguishing the claimed subject-matter from E11 (see above sections 3.1 to 3.3).

- 5.1 As to whether evidence has been provided that the claimed subject-matter provides a successful solution to the problem mentioned above, the patent proprietor referred to comparative test A6 which are alleged to demonstrate that mineral particles having an aspect ratio of more than 5:1 and a maximum dimension of less than 300  $\mu\text{m}$  allow the production of three dimensional articles being less brittle and which exhibit lower anisotropy as far as tensile strength is concerned. The test is based on a comparison between three powder compositions, all comprising an unfilled nylon 12 powder and 25 wt% of a reinforcing agent, which is either FILLEX® 2-AH3 (wollastonite particles with an average fiber diameter of 10  $\mu\text{m}$ , an aspect ratio of 15:1 and an "*Avg maximum dimension*" of 150  $\mu\text{m}$ ), NYAD G® (wollastonite particles with an unspecified average fiber diameter, an aspect ratio of 15:1 and an "*Avg maximum dimension*" of 800  $\mu\text{m}$ ) or Toho Tenax A HT M100 100 $\mu$  (milled carbon fibers with an average fiber diameter of 7  $\mu\text{m}$ , an aspect ratio of 15:1 and an "*Avg maximum dimension*" of 100  $\mu\text{m}$ ).

- 5.1.1 According to the established jurisprudence, if comparative tests are relied on to demonstrate an inventive step on the basis of an improved effect, the nature of the comparison with the closest state of the art must be such that the alleged advantage or effect is convincingly shown to have its origin in the features distinguishing the invention from the closest state of the art (Case Law, *supra*, I.D.10.9), i.e. in the present case the presence of at least 1 wt-% based on the total weight of the composition of mineral reinforcing particles having an aspect ratio of at least about 5:1 and a maximum dimension of less than about 300 microns.
- 5.1.2 The comparison offered with A6 between the powder composition comprising FILLEX® 2-AH3 representing an embodiment of the present invention and the powder composition comprising Toho Tenax A HT M100 is meant to demonstrate the existence of an effect arising from the replacement of carbon fibers by wollastonite fibers. However, that comparison cannot demonstrate any causal link between the effects reported in that test and the replacement of carbon by the mineral wollastonite, since the fibers compared do not only differed by the type of material, but also by their length (150 µm for FILLEX® 2-AH3 vs 100 µm for Toho Tenax A HT M100) and the presence of a coating agent (an aminosilane for FILLEX® 2-AH3 as shown in A7 and the absence of a material applied on the carbon fibers for Toho Tenax A HT M100 as indicated in A9, see legend of the second picture on page 1 and last table on page 2). Accordingly, the technical effects obtained in A6 when replacing Toho Tenax A HT M100 fibers by FILLEX® 2-AH3 fibers cannot be attributed to the nature of the material making the fibers, i.e. wollastonite instead of the type of carbon of which carbon fibres are made.

5.1.3 The second comparison relied on by the patent proprietor based on A6 is between FILLEX® 2-AH3 and NYAD G® which comparison aims at showing the advantages of using the maximum dimension of the mineral particles set out in operative claim 1. That comparison, however, is not made with respect of the closest prior art, which does not use wollastonite particles as reinforcing filler, but carbon fibers. It cannot even show that the specific maximum dimension of the particles defined in present claim 1 of less than about 300 microns brings about any advantage in comparison to the closest prior art, since E11 also uses reinforcing particles having a maximum dimension within that range.

5.1.4 It was also submitted by the patent proprietor based on a further comparison provided in A6 between the composition comprising FILLEX® 2-AH3 and the composition comprising NYAD G® that the size of the reinforcing particles defined in claim 1 was not arbitrary, but allowed to achieve both an efficient processing of the powder in laser-sintering machines and desired mechanical properties of the obtained LS articles, meaning that the purposive character of the selection operated by the patent proprietor when defining the size of the mineral particles should be retained for the formulation of the problem solved over the closest prior art.

Having regard to A7 and E27 describing the reinforcing materials FILLEX® 2-AH3 and NYAD G®, respectively, it is undisputed that these two fillers do not only differ in their maximum dimension, but also in their chemical composition and the presence of an aminosilane coating for FILLEX® 2-AH3, whereas NYAD G® is untreated. The assertion of the patent proprietor based on declaration A14 that the surface coating FILLEX® 2-AH3 does not

provide for any differences in the end parts, meaning implicitly that the effect shown in A6 can be imputed only to the difference in the maximum size of the filler, lacks credibility not only in the light of A7, but also in view of E23. A7 stresses that the coating on FILLEX® 2-AH3 and the form of the filler provide an optimal embedding of the filler in the polymer matrix and a significant increase of the tensile strength, whereas E23 teaches that a coupling agent such as an aminosilane coated on the wollastonite improves the bonding between the polyamide and the mineral surface resulting in an improvement of strength (see last paragraph of page 119, paragraph bridging pages 123 and 124, page 124, last bullet point of section 4.1 and third paragraph of page 126).

Based on the above, the nature of the comparative tests submitted with A6 cannot demonstrate a causal link between the dimension of the reinforcing particles which is defined in operative claim 1 and the alleged advantages both in respect of an efficient processing of the claimed composition in laser-sintering machines and in respect of the mechanical properties of the obtained LS articles. Accordingly, the technical effects allegedly arising from the selection of a dimension of the reinforcing particles as defined in operative claim 1 has not been demonstrated either.

5.1.5 It is also undisputed that the reference in A6 to a lower degree of anisotropy in respect of the tensile strength property which is alleged to result from the use of mineral fibers instead of carbon fibers amounts to addressing a technical effect which is not described or even derivable from the description of the invention in the specification, although powder compositions comprising carbon fibres for the production of LS

articles as described in E11 correspond to the starting point for the present invention as already identified in the patent in suit at its date of filing (see paragraph [0005] of the application as filed). Accordingly, and independently of the probative value of experimental evidence A6, having regard to the jurisprudence of the Boards of Appeal (see Case Law, *supra*, I.D.4.4.1 and I.D.4.4.2) there is no justification for accepting a formulation of the problem solved over E11 which would take into account an improvement of homogeneity of the the mechanical properties of the produced LS articles.

5.2 In addition to this, it is noted that according to established case law, if the inventive step of a claimed invention is based on a given technical effect allegedly obtained over the closest prior art, the latter should, in principle, be achievable over the whole area claimed, i.e. the effect can be acknowledged if it is credible that substantially all the claimed embodiments lead to that particular technical effect (Case Law, *supra*, I.D.9.8.3). As submitted by the opponents no evidence has been submitted to show that further embodiments of operative claim 1, e.g. those using mineral particles other than wollastonite in the absence of carbon fibers, or those using any mineral particle having the dimensions specified in claim 1, including wollastonite, but in the presence of carbon fibers, as explicitly foreseen in the patent in suit (see section 4.2 above), provide a successful solution to the problem formulated by the patent proprietor. Having regard to those embodiments employing carbon fibres the Board cannot accept the formulation of the problem offered by the patent proprietor (see above section 5) which by nature can only concern embodiments which do not use carbon fibres.

5.3 Consequently, it follows from the above analysis that the patent proprietor has not presented any corroborating evidence or explanations making it credible that the purported technical benefit of providing powder compositions for use in producing LS articles exhibiting comparable mechanical properties to those obtained in the closest prior art without the need to use carbon or glass fibers is achieved. Accordingly, the technical problem solved over the closest prior art by the claimed subject-matter as proposed by the patent proprietor needs to be reformulated and can only be considered to lie in the provision of further powder compositions which are suitable for laser sintering.

*Obviousness*

6. It remains to be decided whether or not the proposed solution to the objective problem underlying the patent in suit is obvious in view of the state of the art.

6.1 As shown in E11 by its claim 2 and the last paragraph of page 5, the use reinforcing fibres in the powder compositions of that document is not restricted to carbon or glass fibres, so that the skilled person faced with the problem of providing further powder compositions suitable for laser sintering would consider the use of any reinforcing fiber which he would consider suitable for that purpose. E12 also concerned with powder compositions for laser sintering which can be based on nylon (see paragraph [0045] and claim 6) teaches in paragraph [0047] the use of wollastonite as inorganic filler. Wollastonite inorganic filler as shown in E28 is marketed either with a low-aspect ratio (generally 5:1 or less) or a high-aspect ratio (generally 12:1 and higher) (page



1027, right-hand column, lines 4-5), their use for nylon being described in the same paragraph, as well as in Tables 7 and 8 on page 1035. Most importantly, the use of acicular wollastonite as reinforcing filler for polyamides is the subject-matter of a chapter in E23, a monography about plastics technology. E23 in particular teaches the use of acicular wollastonite having an aspect ratio of between 10:1 and 20:1 and a mean length of 90  $\mu\text{m}$ , which material is coated with  $\gamma$ -aminopropyl-triethoxysilane, i.e. an aminosilane (page 124, last bullet point of section 4.1) when a further improvement of the reinforcing properties is sought (page 126, third paragraph and page 127, Table 4). Moreover, an acicular wollastonite coated with an aminosilane, which is described in the patent in suit as a mineral filler in accordance with the definition of operative claim 1 (aspect ratio 1:15, maximum dimension of less than 300  $\mu\text{m}$ ), namely FILLEX® 2-AH3, is not only commercially available, but recommended as reinforcing filler for thermoplastic compounds as shown in A7. Accordingly, starting from E11, in particular from its embodiment 2, the skilled person having in mind the objective to merely provide further powder compositions which are suitable for laser sintering would be guided by the prior art to use FILLEX® 2-AH3 even in a small amount such as 1 wt-% based on the powder composition in replacement of or in addition to the other reinforcing carbon fibres used in embodiment 2 of E11, arriving thereby in an obvious manner at aqueous compositions falling within the ambit of present claim 1.

- 6.2 The argument of the patent proprietor that the solution proposed by the composition of claim 1 would not be obvious since E23 does not concern the use of wollastonite fibres in laser sintering applications, but merely injection moulding applications, is for the

following reasons not convincing. The fact that E23 does not suggest the use of wollastonite in LS application cannot be considered by the skilled person as a deterrent to their use in such applications, since E23 was obviously published before the development of this technology. Moreover, E12 hints at the use of wollastonite in LS applications and E11 even provides on page 16, lines 17-27 the unmistakable indication regarding its embodiment 2 that the mechanical characteristics of the articles obtained in accordance with the laser sintering technology are by no way inferior to those of the injection-moulded articles addressed in E23 which recommends the use of the acicular wollastonite.

- 6.3 Accordingly, the subject-matter of claim 1 of patent as granted which encompasses obvious embodiments does not meet the requirements of Article 56 EPC with the consequence that the main request is not allowable.

*Auxiliary requests 1 to 13*

7. As can be taken from above sections II and VIII, claim 1 according to auxiliary requests 1 to 13 contains in comparison to claim 1 of the main request various features inserted either alone or as combinations thereof, which features define the maximum dimension of the reinforcing particles which is greater than about 10 microns, the maximum amount of reinforcing particles being mineral particles which is less than 40 wt-% of the powder composition, the chemical nature of the mineral particles which are selected from silicate minerals, calcium minerals, barium minerals, magnesium minerals or combination thereof, or which is defined to be wollastonite or that at least some of the reinforcing particles are

acicular. The patent proprietor did not submit that due to their introduction into claim 1 the problem allegedly solved over the closest prior art (see above section 5) should be formulated in a different manner. It is also not apparent to the Board that as the result of their introduction into the various versions of claim 1, the breadth of these claims would be restricted to subject-matters for which the evidence on file would be sufficient for the Board to acknowledge that the problem formulated by the patent proprietor can be considered to be successfully solved over the whole scope of the claims. In particular the experimental evidence on file still concerns comparisons which do not only differ in the feature(s) distinguishing the claimed subject-matter from the closest prior art, or do not concern embodiments comprising the combined use of carbon fibers and mineral fibres, which are still encompassed by the amended claims. Moreover, the additional feature introduced in claims 1 of auxiliary requests 1 to 3, 5, 6 and 8 that the reinforcing particles have a maximum dimension of greater than about 10 microns does not introduce a further distinguishing feature over the closest prior art, whereas the acicular wollastonite fibers described in A7 which represented an obvious solution of the objective problem also fulfill that additional condition, which implies that this feature has no impact on the above analysis of inventive step. As to the feature added to claims 1 of auxiliary requests 2, 3 and 6 defining the maximum amount of reinforcing particles being mineral particles to be less than 40 wt-% of the powder composition, it is also suggested by the state of the art as mentioned above in respect of the use of a small amount of mineral particles such as 1 wt.-% based on the powder composition (see section 6.1). The restrictions that

mineral particles must be selected from silicate minerals, calcium minerals, barium minerals, magnesium minerals or combination thereof as defined in claim 1 of auxiliary request 3, or that the mineral particles comprise wollastonite as defined in claims 1 of auxiliary requests 4 to 6 or the definition that at least some of the reinforcing particles are acicular or that the mineral particles comprise acicular wollastonite particles, as defined in claims 1 of auxiliary requests 7 and 8, respectively, do not change the above finding in respect of inventive step, since the mineral particles described in A7 whose use was found to be obvious for merely providing further powder compositions also fulfill those additional requirements, meaning that the amended versions of claim 1 still encompass non-inventive embodiments. As a result, claims 1 of auxiliary requests 1 to 8 must also fail on the same ground.

8. Concerning auxiliary requests 9 to 13 and 6A, whose admittance has been contested, the Board notes that even if those were admitted into the proceedings to the benefit of the patent proprietor, those could not overcome the finding that claim 1 of the main request lacks an inventive step over E11. Despite the restricted definition of the polymer powder in claims 1 of auxiliary requests 9 to 13, those are not further distinguished from the closest prior art, as they still allow the use of polyamide 12 (i.e. Nylon-12) employed in embodiment 2 of E11. The various restrictions of the definition of the polymer powder in claims 1 of auxiliary requests 9 to 13 therefore could have no influence on the above analysis of inventive step. It is also undisputed that the amount of laser-sinterable polymer powder and the amount of reinforcing particles defined now in auxiliary request 6A (see section XII

above) would have no influence of the analysis of inventive step. As a result the submissions of those auxiliary requests, whether or not they should be admitted into the proceedings, cannot lead to a conclusion different from that arrived at in respect of the requests of higher ranking.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



L. Stridde

D. Semino

Decision electronically authenticated