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**Datasheet for the decision  
of 13 March 2019**

**Case Number:** T 0392/18 - 3.3.05

**Application Number:** 10013142.4

**Publication Number:** 2269960

**IPC:** C03C10/00, A61K6/00, A61K6/02,  
A61K6/027

**Language of the proceedings:** EN

**Title of invention:**  
LITHIUM SILICATE MATERIALS

**Patent Proprietor:**  
Ivoclar Vivadent AG

**Former Opponent:**  
Vita Zahnfabrik H. Rauter GmbH & Co. KG

**Headword:**  
Lithium silicate materials/IVOCLAR

**Relevant legal provisions:**  
EPC Art. 100(b), 100(c)  
EPC R. 84(2)

**Keyword:**

Grounds for opposition - added subject-matter (no) -  
insufficiency of disclosure (no)  
Remittal to the department of first instance - (yes)

**Decisions cited:**

T 0634/07

**Catchword:**



**Beschwerdekammern**

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Case Number: T 0392/18 - 3.3.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.05**  
**of 13 March 2019**

**Appellant:** Ivoclar Vivadent AG  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 21 December  
2017 revoking European patent No. 2269960  
pursuant to Article 101(3) (b) EPC.**

**Composition of the Board:**

**Chairman** E. Bendl  
**Members:** A. Haderlein  
P. Guntz

## Summary of Facts and Submissions

- I. The appeal was filed by the appellant (patent proprietor) against the decision of the opposition division to revoke the patent in suit.
- II. The wording of independent claims 1, 13 and 14 as granted is as follows:

"1. A process for the preparation of a dental restoration, which comprises

- (a) producing a melt of a starting glass containing the initial components  $\text{SiO}_2$ ,  $\text{Li}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Al}_2\text{O}_3$  and  $\text{P}_2\text{O}_5$  as the main components,
- (b) pouring the melt of the starting glass into a mould to form a starting glass blank and cooling the glass blank to room temperature,
- (c) subjecting the starting glass blank to a first heat treatment at a first temperature to give a glass product which contains nuclei suitable for forming lithium metasilicate crystals, or
- (b') pouring the melt of the starting glass into a mould to form a starting glass blank and cooling the glass blank to a first temperature of 450 to 550°C,
- (c') holding the starting glass blank at the first temperature for a period of 5 minutes to 50 minutes to give a glass product which contains nuclei suitable for forming lithium metasilicate crystals,
- (d) subjecting the glass product of step (c) or (c') to a second heat treatment at a second temperature which is higher than the first temperature to obtain the lithium silicate blank with lithium metasilicate crystals as the main crystalline phase, and
- (e) shaping the lithium silicate blank with lithium meta-silicate [sic] as the main crystalline phase to a desired geometry by machining or by hot pressing to

form a shaped lithium silicate product.

13. Use of a lithium silicate blank with lithium metasilicate crystals as the main crystalline phase prepared according to steps (a) to (d) as defined in any one of claims 1 to 5 for the manufacture of a dental restoration.

14. A lithium silicate blank with lithium metasilicate crystals as the main crystalline phase prepared according to steps (a) to (d) as defined in any one of claims 1 to 5, wherein the blank has a holder to fix it in a machine."

III. According to the opposition division, the ground for opposition pursuant to Article 100(c) EPC did not prejudice the maintenance of the granted patent. In particular, claim 1 had its basis in claims 15 and 18 in combination with page 4, lines 28 to 31 of the parent application, claim 13 constituted a reformulation of claim 15 and claim 14 corresponded to claim 40 of the parent application as filed.

However, none of the requests underlying the decision under appeal complied with the requirement of sufficiency of disclosure. It was not directly and unambiguously derivable from the disclosure of the patent what the heating rate of the nucleated glass blanks should be. Hence, the heating rate can not be considered as a distinguishing feature between example 13 of the patent and the silicate blanks prepared in the following reports:

D10C:           Reproduction of example 13 of  
                  DE 103 36 913 B4 (corresponding to the  
                  patent in suit)

- D10C-2: Conversion table for the composition according to D10C
- Annex C: Determination of the percentages of lithium metasilicate and lithium disilicate of D10C
- D31-B: Experimental report VB-AM-018/17 dated 25 September 2017

These blanks thus fell under the process by which the lithium silicate blank of example 13 is prepared. In Annex C and D31-B, lithium disilicate was obtained as the main crystalline phase and not, as in example 13 of the patent, lithium metasilicate. Thus, when reworking example 13, the obtained result did not always fall within the scope of the claimed invention.

IV. In the proceedings before the opposition division, the following documents were amongst those referred to:

- D2: DE 197 50 794 A1
- D4: Borom, M.P., et al., Strength and Microstructure in Lithium Disilicate Glass-Ceramics, J. American Ceramic Soc. (1975), Vol. 58, No. 9-10, 385-391.
- D8: Höland, W., et al., Control of nucleation in glass ceramics, Phil. Trans. R. Soc. Lond. A (2003) 361, 575-589
- D10-A: Experimental report
- Annex A/B: Heat treatment followed by XRD analysis of glass melts VSM 46803/46808
- D31-A: Experimental report AVS-V1602/17

In the notice of opposition (page 42, penultimate paragraph) reference was made to D8, Table 1, to show that at temperatures below 680°C lithium metasilicate is necessarily obtained as the main crystalline phase.

V. With the statement of grounds of appeal, the appellant filed auxiliary requests 1 to 4. It also filed, *inter alia*, the following documents:

D32: "Herstellung von Rohlingen und Keramisierung (Fa. Ivoclar Vivadent AG)"

D33A: "Quantitative Phasenanalyse 'Block A mit Heizrampe 650°C P3'"

D33B: "Quantitative Phasenanalyse 'Stab B direkt 650°C P2'".

VI. The opponent (former respondent) filed a reply to the grounds of appeal and subsequently withdrew its opposition.

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

*Ground for opposition pursuant to Article 100(c) EPC*

The opposition division was correct in finding that this ground for opposition did not prejudice the maintenance of the patent.

*Ground for opposition pursuant to Article 100(b) EPC*

The opposition division correctly held that many of the objections raised by the former respondent in relation to this ground for opposition were unfounded already because they concerned, at most, an alleged lack of clarity. The patent in suit contained sufficient information that complied with the requirement of sufficiency of disclosure. D10C, Annex C and D31-B failed to show that example 13 of the patent cannot be reproduced. D32, D33A and D33B showed that example 13 could be reproduced resulting in a lithium silicate

blank having lithium metasilicate as the main crystalline phase.

VIII. The arguments of the former respondent, as far as relevant to the present decision, may be summarised as follows:

*Ground for opposition pursuant to Article 100(c) EPC*

Claim 15 of the parent application as originally filed, corresponding to present claim 1, was not directed to a dental restoration; there was no specific basis in the parent application for the combination of steps (b') and (c'). For the same reasons, dependent claims 2 to 11 also were directed to subject-matter which was not originally disclosed in the parent application. Claims 13 and 14 were each directed to a product-by-process which was not disclosed in the parent application as filed.

*Ground for opposition pursuant to Article 100(b) EPC*

As rightly held by the opposition division, the reproductions of example 13 the former respondent had submitted proved that there was a lack of sufficiency of disclosure. The alleged reproductions submitted by the appellant were unable to put into question the probative value of the documents submitted by the former respondent. The patent failed to indicate a method for measuring and determining the crystalline phases. The data contained in the reply to the grounds of appeal showed that different measuring methods led to different contents of lithium disilicate (pages 10 and 11, Table 1) or lithium metasilicate (page 12, Table 2). This was also supported by the data contained



in Annex A/B and D31-A relating to example 22 of D2.

#### IX. Requests

The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted. In the alternative, it requested the maintenance of the patent on the basis of one of auxiliary requests 1 to 4 filed with the statement of grounds of appeal.

### **Reasons for the Decision**

1. Ground for opposition pursuant to Article 100(c) EPC
  - 1.1 In its decision, the opposition division had given specific reasons why, in its opinion, the ground for opposition pursuant to Article 100(c) EPC did not prejudice the maintenance of the patent as granted (see III above). The former respondent, in its reply to the grounds of appeal, did not comment on these reasons, but essentially repeated the arguments put forward in the proceedings before the opposition division.
  - 1.2 The board sees no reason to depart from the view adopted by the opposition division and concludes that the ground for opposition pursuant to Article 100(c) EPC does not prejudice the maintenance of the patent as granted.
2. Ground for opposition pursuant to Article 100(b) EPC
  - 2.1 Claim 1 is directed to a process for the preparation of a dental restoration resulting in a product obtained by shaping a lithium silicate blank with lithium

metasilicate as the main crystalline phase, the process comprising first and second heat treatments (see in particular steps steps (c), (c') and (d) of claim 1). But, claim 1 also extends to processes wherein the blank thus obtained is subjected to a third heat treatment wherein the third heat treatment converts the lithium metasilicate crystals to lithium disilicate as the main crystalline phase (see in particular claims 8 and 9).

2.2 According to Table IV of the patent, in example 13 lithium metasilicate ("LS", see paragraph [0096]) is obtained as the main (sole) crystalline phase after the first crystallisation corresponding to the second heat treatment (see paragraph [0083]). The second crystallisation corresponding to the third heat treatment (see paragraph [0092]) then results in the main crystalline phase being lithium disilicate which is also the case in the other examples shown in Table IV (see paragraph [0096] stating that the main crystalline phase is marked in bold type in Table IV; bold type is not reproduced in the B1 publication but is visible in the text intended for grant attached to the communication pursuant to Rule 71(3) EPC dated 4 November 2015).

2.3 Turning to documents D10C, D10C-2 and Annex C, these concern an alleged reproduction of example 13 of the patent in suit submitted by the former respondent.

This evidence fails, however, to show that example 13 of the patent cannot be reproduced or, put differently, when reproduced, does not yield the required lithium metasilicate as the main crystalline phase after nucleation and after the first crystallisation.

- 2.3.1 Firstly, the results given in Annex C are indicated with an error margin of at least about 10% absolute (see Annex C, bottom of page 2). At values of 14 wt% for lithium metasilicate and 18 wt% for lithium disilicate and considering the above error margin, it is not permissible to conclude from these results that the main crystalline phase was not lithium metasilicate. It should be noted in this respect that there is evidence on file showing that it is indeed possible to measure the lithium metasilicate and lithium disilicate contents in terms of wt.% with a much lower error margin (see D31-B, table on last page; D33A, Table 2; D33B, Table 2).
- 2.3.2 Secondly, the results in Annex C were obtained after crystallisation at temperatures of at most 650°C (see bottom of page 1). In view of the evidence submitted by the former respondent and the appellant, however, in order to achieve crystallisation of lithium disilicate, significantly higher temperatures are necessary. For example, in D4 the minimum temperature to grow lithium disilicate crystals is said to be 755°C (see "Results and Discussion" section, (1)(B), first paragraph). Likewise, D8 referred to in the notice of opposition teaches a temperature of 580°C for the formation of lithium metasilicate as the main crystalline phase in Al<sub>2</sub>O<sub>3</sub>-containing lithium silicate glass ceramics; the lithium metasilicate serves as a precursor which is converted to lithium disilicate at a temperature of 760°C (page 581, first full paragraph and Table 1(b) on page 580). This is also confirmed by data contained in the patent in suit according to which crystallisation of lithium disilicate occurs at 700 to 950°C or at 730°C (see paragraphs [0041] and [0086] and Fig. 3). Also, as submitted by the former respondent, in Annex A/B (see Fig. 1, the "Temperaturprogramm" section

at the bottom of page 1 and the "Ergebnisse" section at the bottom of page 2) and D31A (see item 10 and the table on page 4) lithium metasilicate is obtained at temperatures between 630 and 650°C. In view of this evidence, it is not credible that submitting a glass blank to a crystallisation temperature of only 650°C does not result in lithium metasilicate as the main crystalline phase and yields lithium disilicate instead.

- 2.4 The data contained in D31-B are allegedly a reproduction of example 13 of the patent using a temperature profile as shown in Fig. 3 of D31-B, i.e. heating to 650°C at 2K/min, holding at this temperature for 20 minutes and cooling to room temperature at 2K/min. The results suggest that lithium disilicate as the main crystalline phase is obtained instead of lithium metasilicate (see summary on page 4).

In contrast, documents D32 and D33A concern a reproduction of example 13 as submitted by the appellant. The temperature profile used in "Variante A" for the first crystallisation corresponds to the one applied in D31-B (see D32, page 2, second full paragraph) and results in the main crystalline phase being lithium metasilicate (see D33A, page 4/5, Table 2). Again, this is corroborated by the evidence referred to in 2.3.2 above showing that crystallisation of lithium disilicate generally occurs at temperatures above 700°C.

According to the former respondent, it was not clear which composition was used in D33A. This argument is flawed because page 1 of D32 obviously contains a table with the masses of the components used. The former respondent also argued that the procedure adopted in

D32 deviated considerably from the one used in example 13 of the patent in that during melting the crucible was removed several times in order to replenish it. This argument is flawed too because the same procedure is adopted in D10C submitted by the former respondent (see page 2, table in item 5). The fact that in D33A the dimensions of the steel moulds were not indicated also does not put into question the evidential value of D33A because with the temperature programme used (2K/min for heating up, holding at 650°C and cooling by 2K/min) it is not credible that the heat capacity of the moulds plays a significant role.

D31-B thus fails to show that the reproduction of example 13 of the patent does not yield the required lithium metasilicate as the main crystalline phase.

2.5 The opposition division concluded that the lithium silicate blanks of Annex C and of D31-B were prepared according to example 13 of the patent and that the deviating results were the consequence of the selection of different parameters set for the XRD analyses. Since the patent did not indicate these parameters, there was a lack of sufficiency of disclosure.

As set out above, Annex C and D31-B fail to show that example 13, when reproduced, does not yield the required lithium metasilicate as the main crystalline phase after nucleation and after the first crystallisation. The opposition division thus based its conclusion on the wrong premise. The alleged absence of information concerning the parameters set for the XRD analyses is therefore not a bar to the sufficiency of disclosure. Likewise, the evidence on file does not allow the conclusion to be drawn that the reproduction of example 13 does not always fall within the scope of

the claimed invention.

- 2.6 The remaining arguments of the former respondent essentially relate to the alleged lack of definition of the term "main crystalline phase" and the alleged lack of information about the measuring method in order to determine whether a specific lithium silicate blank fell within the boundaries of claim 1. In this context, the former respondent relied on D2, Annex A/B and D31A.

These arguments are not persuasive for the following reasons.

- 2.6.1 Even if Annex A/B and D31A were considered to indeed relate to the reworking of example 22 of D2, the difference in lithium metasilicate content as submitted by the former respondent (28 wt% compared to 25.4 wt%) fails to show that the term "main crystalline phase" is not sufficiently clear to the skilled person wishing to carry out the invention. To the contrary, in Annex A/B, lithium metasilicate is said to be the main crystalline phase (see page 2, penultimate paragraph) with minor amounts of  $\text{LiAlO}_3$ . Likewise, in D31A (see page 4, conclusion section) lithium metasilicate is said to be the sole crystalline phase which was detectable by XRD.
- 2.6.2 The data contained in Table 1 in the paragraph bridging pages 10 and 11 of the reply to the grounds of appeal also do not raise serious doubts concerning sufficiency of disclosure. These data concern an unidentified material which comprises lithium disilicate as the main phase. Likewise, the data contained in Table 2 on page 12 of the reply relate to an unidentified lithium silicate blank where the percentage of lithium disilicate is not indicated. Moreover, the margin of error appears to be relatively small, i.e. below 10%

(relative).

- 2.7 In conclusion, there are no serious doubts substantiated by verifiable facts with respect to the sufficiency of disclosure (see the Case Law of the Boards of Appeal of the EPO, 8th edition 2016, II.C. 6.1.4, second paragraph).
- 2.8 The ground for opposition pursuant to Article 100(b) EPC therefore does not prejudice the maintenance of the patent in suit.

### 3. Remittal

The decision under appeal deals only with the grounds for opposition pursuant to Article 100(b) and (c) EPC; it does not deal with novelty or inventive step. The board thus exercises its discretion (Article 111(1) EPC) and remits the case to the department of first instance for further prosecution. However, in view of the withdrawal of the opposition, the opposition division will need to decide first whether or not to continue the opposition proceedings of its own motion (Rule 84(2) EPC). The board's decision to remit should not be interpreted as an indication of the conclusion to be reached in this respect (see T 634/07, Reasons 4).

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division for further prosecution based on the main request (patent as granted).

The Registrar:

The Chairman:



C. Vodz

E. Bendl

Decision electronically authenticated