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D E C I S I O N
of 21 November 2002

Case Number: T 0184/00 - 3.3.5

Application Number: 92913926.9

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IPC: C03C 17/30

Language of the proceedings: EN

Title of invention:

Method for treating fluoroaluminosilicate glass

Patentee:

MINNESOTA MINING AND MANUFACTURING COMPANY

Opponent:

- (1) THERA Patent GmbH & Co. KG Gesellschaft für industrielle Schutzrechte
- (2) Dentsply International Inc.
- (3) Dental-Material Gesellschaft mbh

Headword:

FAS Glass/3M

Relevant legal provisions:

EPC Art. 54, 56, 111(1), EPC R. 67, 68(2)

Keyword:

"Novelty (yes)"
"Comparative examples"
"Burden of proof"
"Substantial procedural violation (yes)"

Decisions cited:

T 0219/83, T 0939/92, T 0585/92, T 0652/97, T 0740/93,
T 0552/90, T 0233/90, T 0069/83, T 0296/87, T 0229/85,
T 0099/85

Catchword:

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Case Number: T 0184/00 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 21 November 2002

Appellant: MINNESOTA MINING AND MANUFACTURING COMPANY
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 27 January 2000
revoking European patent No. 0 588 950 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: R. K. Spangenberg

Members: M. M. Eberhard
J. H. Van Moer

Summary of Facts and Submissions

I. European patent No. 588 950 based on application No. 92 913 926.9 having the international filing date of 28 May 1992 was granted with 37 claims. Granted claim 1 has the following wording:

"1. A method for treating fluoroaluminosilicate glass, comprising the steps of:
a. mixing finely-divided fluoroaluminosilicate glass with an aqueous silanol solution, and
b. drying the glass."

Respondents 1, 2, 3 (opponents 1, 2, 3) filed notices of opposition requesting revocation of the patent for lack of novelty and lack of inventive step. They relied *inter alia* on the following documents:

D1: DE-A-39 41 629

O1D3: DE-B-22 25 146

O1D4: Silane Coupling Agents, E.P. Plueddemann, 1982, pages 32, 33, 49

O1D5: Union Carbide, Adhesion Promoters, A-174 silane

O2D3: Silane Coupling Agents, Ind. & Eng. Chemistry, vol. 58, No. 3, 1966, pages 33 to 37

O3D4: EP-A- 060 911

The opposition division decided to revoke the patent. The decision was based on sets of amended claims all filed on 9 November 1999. Claim 1 of the main and first auxiliary requests was identical to granted claim 1. The opposition division held that the subject-matter of

claim 1 as granted was novel over the disclosure of D1. Starting from D1 as the closest prior art the technical problem of the patent in suit was to find an alternative to ethanol as a solvent for hydrolysing the silane. The claimed solution to this problem was obvious in view of the disclosure of O1D5 or O1D3. The subject-matter of claim 1 of the second auxiliary request relating to the use of an acidic or basic aqueous silanol solution was also obvious since acidic catalysts were used in very similar silanisation reactions in O3D4.

- II. The appellant (patent proprietor) lodged an appeal against this decision and filed 8 sets of amended claims as a main request and seven auxiliary requests as well as an experimental report (hereinafter E2) with the statement of grounds of appeal dated 17 May 2000. In reply to a communication from the board a fifth auxiliary request was submitted in replacement of the previous one. Respondent 2 filed an experimental report on 8 December 2000, hereinafter D9. Reference was made to additional documents, namely P6 (Biomaterials Vol. 19, 1998, pages 529 to 539) and D13 (3M F2000 Compomer Restorative System, 1997). Respondent 1 withdrew its opposition by a letter dated 12 February 2001.

Oral proceedings were held on 21 November 2002. Clarity and allowability of the amendments in claim 27 of the main request filed with the statement of grounds of appeal as well as novelty and inventive step of the method of claim 1 were discussed. The appellant then submitted five sets of amended claims as a main request and four auxiliary requests. The claims of the main request filed at the oral proceedings differed from the granted claims in that the product claims 27 to 34 have

been deleted and the terms "**acidic or basic**" have been incorporated in claim 1 before "aqueous silanol solution".

III. The appellant requested that the decision under appeal be set aside and that the patent be maintained with the claims of the main request filed at the oral proceedings or, in the alternative, with the claims of any one of the first to fourth auxiliary requests filed at the oral proceedings. He further requested reimbursement of the appeal fee. Respondents 2 and 3 requested that the appeal be dismissed or, in the alternative, that the case be remitted to the first instance for further prosecution on the basis of the claims according to the main request filed at the oral proceedings.

IV. The appellant's arguments can be summarised as follows:

The method of claim 1 of the main request was novel since D1 did not disclose the presence of silanol in the solution. The appellant's experimental report filed on 8 October 1999 (hereinafter E1) showed that even in a solution containing 96% ethanol and 4% water no detectable amount of silanol was formed after 24 hours. Gas chromatography was a highly sensitive technology which was able to detect amounts to the level of ppm. The objective problem solved by the invention with respect to the closest prior art D1 was to provide a fluoroaluminosilicate glass (FAS glass) that could be used to produce improved glass ionomer cements in terms of the fluoride release while maintaining at least the level of strength achieved by the prior art. The improvement in fluoride release could be inferred from example 1 and comparative example 1 and from the experimental report E2. Respondent 3's experiments in D9 had been conducted using a compomer rather than a glass ionomer cement and could not disprove the effects

achieved with the present invention. Furthermore, according to D13 compomers were put on the market in late 1993, and thus D9 was based on a comparison with products which were not state of the art. The burden of proof that the said effect was not obtained in the whole ambit of the claim rested on the respondents and the benefit of the doubt should be given to the patentee (see T 219/83). Experiment 1B of report E2 showed that a slight improvement was obtained with respect to a neutral aqueous silanol solution. None of the cited documents gave a hint as to how the fluoride release of glass ionomer cements might be improved. The documents taught towards using silanes and, as acknowledged by respondent 3 himself, the skilled person would have expected a decrease in the fluoride release of the glass ionomer cement by effecting a more active silanisation of the glass powder. Therefore, the improvement of the fluoride release despite the use of an aqueous solution of silanol was surprising. The appellant contested respondent 3's allegation that it was common general knowledge that the addition of an acid would improve the fluoride release.

The appellant requested refund of the appeal fee. Referring to decisions T 740/93, T 652/97 and T 522/90, he argued that the decision was insufficiently reasoned and thus contrary to Rule 68(2) EPC, which constituted a substantial procedural violation.

V. The respondents presented inter alia the following arguments:

The subject-matter of claim 1 of the main request lacked novelty with respect to D1. Taking into account the common general knowledge before the priority date, the skilled person would directly and immediately have thought of using acidic or basic aqueous silanol solutions when reading the information in D1 that the

silane coupling agent was applied to the glass **in a known manner** (T 233/90). The instruction of the manufacturer of silane A-174 in O1D5 was to be seen in conjunction with any use of A-174 and was thus immediately available to the users of A-174. The expression "aqueous" silanol solution had to be construed in the technical context of the patent in suit, namely that sufficient water should be present to hydrolyse the silane. The degree of hydrolysis could be as low as 0.1% according to the dependent claims. It was common general knowledge that silanol groups were necessary for silanes to function as coupling agents and that very small amounts of water were sufficient to hydrolyse the silane as shown by O1D4 and O2D3. The feature that the solution was basic or acidic was not novel since, in practice, a pH value of not exactly 7 was automatically obtained. IR-spectroscopy used in the appellant's experiments E1 was not suitable to detect small amounts of silanol.

The process of claim 1 did not involve an inventive step. The appellant's tests in E2 had been carried out at a relatively low acidic pH of about 1 and thus could not be used as a posteriori evidence for all pH values. The patent in suit did not include examples in which the pH was from 3.5 to <7 for acidic solutions or from >7 to about 10 for basic solutions. There was no evidence that all glasses of the broad class of FAS glasses and all kinds of silanes would lead to an improved fluoride release. It was not credible that at hydrolysis levels as low as 0.1% or less and at pH values close to 7, the claimed method would lead to a treated glass having an improved fluoride release when used in glass ionomer cements, whatever the kind of silane and FAS glass. The burden of proof that an improvement was obtained in the whole ambit of the claim rested on the appellant (see decisions T 939/92 and T 585/92). Respondent 2 offered to provide

experimental evidence in this respect. The experiments in D9 further showed that the improvement of the fluoride release reported in E2 was not achieved. The fact that in D9 the FAS glass had been further processed into a compomer rather than into a glass ionomer cement was not relevant since the transition between these two classes of products was continuous and the glasses of both materials could exhibit a fluoride release as disclosed in D13.

If the essential property of cements produced with the glass treated by the claimed method were the high fluoride release, then the closest prior art would be a glass ionomer cement produced with an untreated glass such as Control A of the patent in suit. The strength data reported in some examples of the patent in suit were lower than those obtained with Control A.

Furthermore, the strength depended on the kind of silanol used, however claim 1 covered the use of any kind of silanol and the pH was also not limited. If a better fluoride release was obtained with respect to Control A, it resulted from the presence of the acid, the latter enhancing the release of the fluoride ions from the glass, and not from the silanisation.

Even if D1 were taken as closest prior art and the appellant's arguments in respect of the technical problem followed, then the claimed subject-matter would still be obvious since it was common general knowledge before the priority date that the addition of an acid enhanced the fluoride release from the glass. Reference was also made to decisions T 69/83 and T 296/87 in connection with achieving a surprising effect.

Reasons for the Decision

1. The appeal is admissible.
2. The claims of the main request meet the requirements of Article 123(2) and (3) EPC. The use of an **acidic or basic** aqueous silanol solution in the method as defined in claim 1 is directly and unambiguously derivable from the PCT application page 2, lines 22 to 26, page 4, lines 9 to 10 and 24 to 25. The amendment introduced in the claim also does not extend the scope of protection with respect to granted claim 1.
3. Novelty of the process of claim 1 according to the main request with respect to D1 was still disputed by the respondents at the appeal stage.

D1 discloses a dental glass ionomer cement composition comprising a FAS glass powder, the surface of which may optionally be treated with an organic compound having a polymerisable, ethylenically unsaturated double bond, for example vinylic silane coupling agents or unsaturated carboxylic acids. The surface of the FAS glass powder may be treated with the organic compound **in a known manner**. For instance, the organic compound may be mixed with the FAS glass powder for reaction after having been dissolved or suspended in a suitable solvent, and the treated glass is then dried (see claims 1 and 7; column 9 line 64 to column 10, line 35). In examples 6, 7, 14 and 15 a 10% solution of γ -methacryloxypropyltrimethoxysilane or vinyltriethoxysilane in ethanol is mixed with the glass powder in a mortar and the resulting mixture is then dried.

- 3.1 As pointed out by the respondents, ethanol is available on the market in several purity grades, for example in the anhydrous form (absolute ethanol) or in form of the azeotropic composition containing about 96% ethanol and 4% water. D1 does not indicate the purity of the

ethanol used in the examples. Regarding the expression "aqueous" solution used in claim 1, the board observes that an aqueous solution would normally be construed as not covering the said azeotropic composition but rather mixtures having a much higher water content. However, according to the patent in suit **preferred** amounts of water are about 20% to 99,9% based on the total weight of the treating solution (see dependent claim 23 and description page 5, lines 20 to 23), which means that the amount of water may still be lower than 20%. In the said passage on page 5 it is further indicated that the water in the treating solution facilitates hydrolysis of the silane and according to dependent claims 2 and 3 the degree of hydrolysis of the silane in the silanol solution is at least 0.1%. This low hydrolysis level implies that the amount of water necessary for the hydrolysis may be small. Therefore, the "aqueous" solution as defined in the patent in suit may contain an amount of water lower than 20% but the lower limit is not precisely defined. In these circumstances the expression "aqueous" solution used in claim 1 is considered to encompass an azeotropic composition containing about 96% ethanol and 4% water.

As indicated above, D1 does not disclose the purity grade of the ethanol used in the examples. However, the respondents disputed that the skilled person would have to choose between several possibilities. According to the respondents, the skilled person would, on the basis of common general knowledge, have immediately thought of using the less expensive azeotropic composition. The question whether or not the skilled person reading the examples of D1 would **inevitably** use the said azeotropic composition for treating the FAS glass powder can however remain open since it is not decisive for the outcome of the decision upon novelty with respect to D1 (see point 3.2 below).

3.2 Assuming in favour of the respondents that the skilled person would inevitably use the said azeotropic composition when reading D1, then the claimed method would still differ from the examples of D1 in that the glass is treated with a **silanol** solution instead of a silane solution. As shown by the appellant's experimental report E1, experiment 1A, a 10% solution of A-174 silane (γ -methacryloxypropyltrimethoxysilane) in ethanol containing 4% water does not contain any detectable amounts of silanol after 24 hours from the preparation of the solution. On the contrary, in the acidic solution (pH=3) containing equal amounts of water and methanol according to experiment 1B complete conversion of the silane to silanol was achieved in half an hour. Both gas chromatography and IR-spectroscopy were used to detect the presence of silanol groups. Experiments 1A and 1B of E1, which were submitted on 8 October 1999, were contested by respondent 2 for the first time at the oral proceedings, who argued that IR-spectroscopy used in these experiments was not suitable to detect small amounts of silanol. However, not only IR-spectroscopy but also gas chromatography was used for the analysis. As pointed out by the appellant gas chromatography is a highly sensitive technology which is able to detect amounts at the level of ppm. Respondent 2 then also contested the suitability of the gas chromatography analysis; however although the burden of proof rests with him to support this allegation, no evidence was provided to show the unsuitability of the said method for detecting low amounts of silanol. In these circumstances, the board comes to the conclusion that the process of claim 1 of the main request differs from the disclosure in the examples of D1 by the treatment of the FAS glass with an acidic or basic aqueous **silanol** solution instead of a silane solution. The board is aware of the fact that the expression "silanol solution" used in claim 1 means that the solution

comprises silane and silanol since, according to dependent claims 2 and 3, the degree of hydrolysis of the silane in the silanol solution is at least 0.1%. In other words the amount of silanol in the solution may be relatively small. This, however, is sufficient to distinguish the claimed process from the process illustrated in the examples of D1 which involve the use a silane solution containing no detectable amount of silanol, even with ethanol in form of the said azeotropic composition.

Under these circumstances the question whether or not an "acidic or basic" solution is, in practice, automatically achieved need not be decided since it is not decisive for the outcome of the decision upon novelty with respect to D1.

- 3.3 The respondents further attack the novelty of the claimed method on the basis of the general teaching disclosed in column 10 of D1 where it is referred to the treatment of the FAS glass powder with the vinylic silane coupling agent in **a known manner** (see point 3 above). According to the respondents it was common general knowledge before the priority date to apply the silane coupling agent to the glass powder in the form of an acidic or basic aqueous solution. It was referred in particular to O1D5 and O1D4. Although O1D4 discloses that it is commercial practice to apply silane coupling agents to glass from aqueous solutions of the alkoxy silanes (see page 49, first paragraph), O1D4 is silent as to whether this statement relates to glass fibres or to glass in powder form. On page 33, second paragraph, it is indicated that mineral fillers in contact with normal atmosphere carry enough moisture on the surface to hydrolyse methoxysilanes or chlorosilanes applied from anhydrous solvents or added as integral blends during preparation of the resin composites. It can be derived therefrom that the silane

may be applied to fillers using anhydrous solvents. O2D3 discloses that in commercial systems, the preferred application solvent is water and that the use of silanes in water results in the hydrolysis of the silane to a silanol, which is the active species in bonding to glass (page 34, right-hand column, lines 25 to 29). However, O2D3 mainly discussed bonding between resins and glass fibres (see left-hand column, last paragraph, whole right-hand column) and Tables I to VI all concern glass fibres, in the form of fibres, mats or cloths. Nothing is said about the solvent employed in the case of glass powders for use in glass ionomer cements. O1D5 discloses that the A-174 silane is first dissolved in acidified water having a pH of 3.5-4.0 and then this aqueous solution is added to the other components of the size-binder mixture (see page 2, point 2, 2nd paragraph). However, this statement relates to the application of size-binder formulations to glass rovings, ie continuous textile fibres, and not to a glass powder as used in the preparation of glass ionomer cements. It can be inferred from O1D5 that for other applications, for example the use of silane as clay or glass tile primer, an alcohol solution of the silane is used (see page 2, point 1). For the third application disclosed in O1D5, ie as additive in filled polyester resin composites which may contain clay, silica, quartz, glass or silicates as the filler, the silane can be introduced in the bulk of the resin where it is dissolved and migrates to the surface of the filler material which is added subsequently (see page 2, point 3, 3rd paragraph). The same effect is possible by pretreating the filler before incorporating it into the resin, the silane being applied directly to the filler in a mixing device (page 3, left-hand column, lines 1 to 7). It can be inferred from O1D5 that several ways of applying the silane to surfaces were known in 1984 and that the manner the silane is used depends on the form of the material (continuous

glass fibres, glazed substrates or particulate materials) and/or on the kind of product to be manufactured. It is not directly and unambiguously derivable from the evidence provided by the respondents that, at the relevant date of D1, the known manner to treat a FAS glass powder which is used for manufacturing glass ionomer cements, was to apply the silane coupling agent to the glass powder in an acidic or basic aqueous solution. The board observes in this respect that if this had been the known way of treating glass powder in this technical field, then the teaching in column 10 of D1 referring to the "known manner" would not be consistent with the examples of D1 where a solution of a silane in ethanol is used. The situation in the present case is thus clearly different from that in decision T 233/90 of 8 July 1992 (see point 3.3 of the reasons) relied upon by the respondents. Therefore, this line of argumentation concerning novelty must also fail.

- 3.4 It follows from the above that the process as defined in claim 1 of the main request is novel over the disclosure of D1 at least in that the starting "aqueous" solution used to treat the FAS glass powder comprises a silanol.
4. D1 represents the closest prior art. According to the patent in suit, the treatment of the FAS glass with a silanol leads to improved glasses which are easily mixed with aqueous polyacrylic acid solutions, have excellent fluoride release and provide cements with improved low diametral tensile strength (hereinafter DTS) and improved fracture toughness. The cements of the invention are said to exhibit much greater fluoride release than a comparison cement made by the procedure outlined in examples 6 and 7 of US-A-5 063 257, which correspond to examples 6 and 7 of D1 (see patent in suit, page 2, lines 40 to 42 and page 8, line 47 to

page 9, line 45).

According to the established jurisprudence of the boards, which the present board can follow, the technical problem addressed by an invention has to be formulated in such a way that it does not contain pointers to the solution or partially anticipate the solution (see T 229/85, OJ 1987, 237; T 99/85, OJ 1987, 413). As the technical problem defined in the appealed decision contains pointers to the solution, it is not defined in an appropriate way. The appellant submitted that, starting from D1 as the closest prior art, the technical problem which had been solved by the claimed process was to provide a FAS glass that could be used to produce improved glass ionomer cements in terms of the fluoride release while maintaining at least the level of strength achieved by the prior art. He further argued that in particular comparative example 1 and example 1 of the patent in suit as well as experimental report E2 showed that the fluoride release had indeed been improved by using an acidic or basic aqueous silanol solution.

The board observes that in comparative example 1 the general procedure outlined in examples 6 and 7 of D1 was indeed used with some minor variations which according to the patent in suit are not believed to affect the result (see page 8, lines 47 to 48). The minor variations can easily be identified by comparing the procedure used in comparative example 1 with those stated in examples 6 and 7 of D1. Respondent 3 has given no reason why the said variations would affect the result and thus has not substantiated his allegation that comparative example 1 would not be representative of the process of D1. The use of anhydrous ethanol represents an alternative covered by the process of D1. In example 1 trifluoroacetic acid was used to acidify the solution to pH 3.5 and form the

silanol. This represents an embodiment falling within the process as defined in claim 1. It is credible in view of comparative example 1 and example 1 that an improvement of the fluoride release is indeed obtained at least with an acidic solution having a pH of 3.5 (see Table III of the patent in suit). Furthermore, it can also be inferred from a comparison of Experiment 1A with experiment 1C of experimental report E2 that a substantial improvement of the fluoride release is achieved when the FAS glass is treated with an **acidic** aqueous **silanol** solution compared to an aqueous **silane** solution. The silane solution used in Experiment 1A contains about 59 wt% water and 29 wt% ethanol and is therefore even closer to the claimed method than the solution of silane in ethanol used in D1. The pH of the acidic silanol solution in Experiment 1C of E2 is not given, it was estimated to be about 3.5 by the appellant and about 1 by respondent 2. It appears that the pH is in any case lower than 4.

Respondent 3 filed experimental report D9 as counter-evidence with the view to proving that appellant's experimental report E2 is not correct and that no improvement in fluoride release is obtained. In D9, the treated glass was mixed with a cement mixture to produce a compomer instead of a resin-modified glass ionomer cement as in D1 or in the patent in suit. As pointed out by the appellant, neither a polyacid nor water have been incorporated in the respondent's experiments although these two components are essential components to prepare glass ionomer cements.

Furthermore, it can be inferred from P6 and D13 that compomers have a reduced release of fluoride and behave more like composite resins than glass ionomer cements (see P6 page 538, left-hand column, last paragraph; D13 page 6, 1st and 2nd paragraphs). In these circumstances the board is not convinced that the experiments in D9 disprove the improvement of fluoride release shown in

the patent in suit and in experimental report E2 with an acidic silanol solution at pH values lower than 4.

The appellant's comparative experiments with the A-174 silane were, however, all performed at acidic pH <4. In example 18 involving the use of an acidic alkoxysilane at a pH of 4.2, no result of fluoride release is reported. In example 7 the pH of the treatment solution is 10.3, however both the glass and the cement forming copolymer seem to differ from those used in comparative example 1, which might have an influence on the fluoride release result. The respondents have contested that an improvement of the fluoride release would also be obtained with respect to the process of D1 **in the whole ambit** of claim 1, in particular at pH values close to 7 and at hydrolysis levels of about 0.1% or less, regardless of the silane used. The burden of proof for the allegation that the said improvement is not achieved over the whole ambit of the claim normally rests on the person who has made this allegation, ie in the present case the respondents/opponents (see T 219/83, OJ EPO 1986, 211, point 12 of the reasons, T 939/92, OJ EPO 1996, 309, point 2.6.1 of the reasons). According to T 585/92 (9 February 1995, point 3.2 of the reasons) which respondent 3 relied upon, once the opposition division has revoked the patent, the burden of proof is shifted to the proprietor of the patent to demonstrate on appeal that the reasons for revoking the patent were not justified, ie that the opposition division's decision was wrong on its merits. However the situation is different in the present case in that the decision under appeal is silent as to why an improvement of the fluoride release was not taken into account (see point 5 below). Furthermore, the appellant filed experimental report E2 with the grounds of appeal to show that the said improvement was achieved. The question whether or not the said improvement is obtained in the whole ambit of

claim 1 was briefly mentioned by respondent 2 in reply to the grounds of appeal (see the two first line on page 4 of the letter dated 16 October 2000), but detailed arguments concerning this issue were presented only at the oral proceedings before the board. In this context, the board also observes that the appellant contested respondent 3's experimental report D9 only 6 weeks before the oral proceedings although D9 was submitted on 18 December 2000 as counter-evidence to disprove the improvement of the fluoride release reported in E2. Therefore, contrary to the appellant's allegation the respondents did not have almost two years to file further evidence concerning the question whether or not an improvement was achieved. In view of Experiment 1B in appellant's experimental report E2 and considering the minimal difference between the claimed process and that of D1, the board has itself doubts that the said improvement would be obtained in the whole range of claim 1, in particular at an acidic or a basic pH close to 7 and at low hydrolysis levels of 0.1% or less covered by claim 1 (see the value of 0.1% in dependent claim 3) for the following reasons. Experiment 1B was performed using as a neutral aqueous silanol solution. The appellant has confirmed at the oral proceedings that, under the conditions used to prepare the starting solution, **complete hydrolysis** of the silane had been achieved. From the comparison of the fluoride release obtained in Experiment 1B with that reported in Experiment 1A for the silane solution, it can be inferred that only a slight improvement is achieved as indicated by the appellant himself on page 6 of the letter dated 17 May 2000. In view of the slight improvement obtained with a neutral silanol solution at a very high degree of hydrolysis, the board doubts, in the absence of further evidence, that a treatment of the FAS glass with an aqueous silanol solution having a pH close to 7 (for example 6.9 or 7.1) and a hydrolysis level of 0.1% or less would

also result in an improvement of the fluoride release of the final glass ionomer cement with respect the process disclosed in D1. It is observed in this respect that an aqueous silanol solution having a degree of hydrolysis of 0.1% or less as covered by claim 1 essentially contains a silane and, thus, differs from the silane solution of D1 by the presence of a relatively small amount of silanol. Under the very exceptional circumstances of this case, and considering that the question whether or not the said improvement is achieved in the whole ambit of claim 1 is an essential issue for the assessment of inventive step, the board has come to the conclusion that this issue should be clarified before taking a decision on inventive step and, thus, that the parties should be given the opportunity to provide further evidence in this respect. At the oral proceedings, respondent 2 offered in particular to submit further comparative experiments to show that the addition of a small amount of acid to the silane solution of D1 would not lead to an improvement of the fluoride release. For the reasons given above, the board, in the exercise of its discretionary power pursuant to Article 111(1)EPC, finds it appropriate to remit the case to the opposition division for further prosecution on the basis of the main request filed at the oral proceedings.

5. In support of his request for reimbursement of the appeal fee pursuant to Rule 67 EPC, the appellant argued that the decision of the opposition division was insufficiently reasoned and thus did not meet the requirement of Rule 68(2) EPC, which constituted a substantial procedural violation. The appellant pointed out in particular that the whole reasoning during the oral proceedings before the opposition division and in the written proceedings was construed around the effect of improved fluoride release achieved by the invention.

However the corresponding statement of the problem solved by the invention was completely ignored in the decision without giving any reasons as to why this line of argumentation would fail. The appellant made reference to decisions T 740/93, T 652/97 and T 522/90.

According to the case law of the boards, the requirement of Rule 68(2) that the decision shall be reasoned can only be met when the chain of reasoning in the decision is complete, which means that no relevant evidence present in the proceedings and possibly having an influence on the result of the reasoning, has been omitted, or that at least some motivation on crucial points of dispute has been given. Issuing a decision without providing the appellant with any reasoning upon his main argument or on crucial points of dispute conflicts with Article 68(2) EPC and constitutes a substantial procedural violation (see T 652/97 of 16 June 1999, point 2.5; T 740/93 of 10 January 1996, points 5.4 and 5.5; T 522/90 of 8 September 1993, point 9.1). The board sees no reason to depart from this jurisprudence.

In the present case, the appellant pointed out in the written proceedings that, as shown in comparative example 1 of the patent in suit, the glass ionomer cements of D1 had both a low fluoride release as well as a low DTS compared to the glass ionomer cements of the invention. The high fluoride release was accordingly included in the formulation of the problem to be solved (see letter of 26 August 1998, page 6 penultimate paragraph). It can also be derived from the minutes of the oral proceedings before the opposition division that the appellant again relied on an improvement of the fluoride release with respect to the process of D1 in his line of argumentation concerning inventive step: see minutes, page 3 penultimate paragraph, page 4, 2nd and 5th paragraphs. Respondent 3

confirmed at the oral proceedings before the board that the minutes were correct in this respect.

The decision under appeal is, however, completely silent about the improvement of fluoride release with respect to D1. In paragraph 5 concerning inventive step, the following is stated as regards the technical problem with respect to D1 : "Starting from this prior art, the objective technical problem of the patent in suit (at the level of the process claims) is reduced to the problem of finding an alternative to ethanol as a solvent for hydrolysing the silane " (see page 7, first paragraph). The decision gives no reasons as to why the problem "is reduced" to the one indicated above and why the improvement of the fluoride release was not considered for the definition of the problem to be solved. The board observes that the said improvement with respect to the process of D1 was not only relied upon by the appellant in writing and at the oral proceedings but is also discussed in the patent in suit on the basis of comparative examples: see comparative example 1 and example 1 and the results of fluoride release reported in Table III. The decision also contains no statement from which it could immediately be apparent why this improvement was not taken into account. Although the requirement of Rule 68(2) EPC does not mean that all arguments submitted should be dealt with in detail, the appellant's argument concerning the improvement of the fluoride release with respect to the closest prior art is obviously an essential argument concerning inventive step and a crucial point of dispute, which may have an influence on the outcome of the decision upon inventive step. Therefore, the decision under appeal is considered not to meet the requirement of Rule 68(2) EPC, which constitutes a substantial procedural violation. As the appeal is deemed to be allowable and reimbursement of the appeal fee is equitable by reason of a substantial

procedural violation, the request for reimbursement of appeal fee is granted.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution.
3. The appeal fee shall be reimbursed.

The Registrar:

The Chairman:

U. Bultmann

R. Spangenberg