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**Datasheet for the decision  
of 14 October 2008**

**Case Number:** T 1500/05 - 3.3.03

**Application Number:** 01911001.4

**Publication Number:** 1278798

**IPC:** C08K 5/42

**Language of the proceedings:** EN

**Title of invention:**

Fire-retarded polycarbonate resin composition

**Applicant:**

Sabic Innovative Plastics IP B.V.

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 123(2)

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Inventive step - no (main request)"

"Amendments - added subject-matter - yes (auxiliary requests)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 1500/05 - 3.3.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.03  
of 14 October 2008

**Appellant:** Sabic Innovative Plastics IP B.V.  
Plasticslaan 1  
NL-4612 PX Bergen op Zoom (NL)

**Representative:** Modiano, Micaela Nadia  
Modiano Josif Pisanty & Staub Ltd.  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 8 July 2005  
refusing European application No. 01911001.4  
pursuant to Article 97(1) EPC 1973.

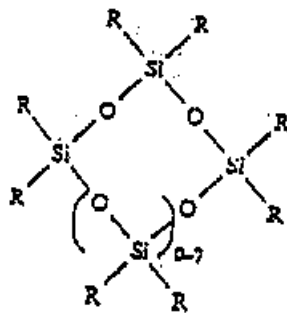
**Composition of the Board:**

**Chairman:** R. Young  
**Members:** W. Sieber  
H. Preglau

## Summary of Facts and Submissions

I. European patent application No. 01911001.4, based on International application PCT/US01/05427, filed on 20 February 2001 in the name of General Electric Company (now Sabic Innovative Plastics IP B.V.), claiming a US priority of 28 April 2000 (US 09/560770), and published under number WO 01/83606 A1, was refused by a decision of the Examining Division issued on 8 July 2005. The decision was based on Claims 1-10 filed during the prosecution of the case before the examining division, whereby Claim 1 read as follows:

"1. A composition comprising polycarbonate resin, and a fire-retardant component comprising a perfluoroalkane sulfonate and a cyclic siloxane, wherein the cyclic siloxane has the general formula



wherein R is independently selected from the group consisting of C<sub>1</sub> to C<sub>36</sub> alkyl, fluorinated or perfluorinated C<sub>1</sub> to C<sub>36</sub> alkyl, C<sub>1</sub> to C<sub>36</sub> alkoxy, C<sub>6</sub> to C<sub>14</sub> aryl, aryloxy of 6 to 14 carbon atoms, arylalkoxy of 7 to 36 carbon atoms, and C<sub>1</sub> to C<sub>36</sub> alkylsubstituted aryl of 6 to 14 carbon atoms."

II. According to the decision, the claimed subject-matter was novel over the cited prior art but was obvious in

view of the combination of D1 (EP 0 625 547 A1) and D2 (US 3 971 756 A).

D1 was considered to be the closest prior art which disclosed flame retardant polycarbonate resin compositions comprising a perfluoroalkane sulfonate salt and a polysiloxane containing organoxysilyl group(s) bonded to a silicon atom through a divalent hydrocarbon group. The applicant had relied on a synergistic effect achieved by the use of the perfluoroalkane sulfonate and the cyclic siloxane in order to justify an inventive step. Since, however, the alleged synergistic effect had not been demonstrated against the state of the art according to D1 or D2, the examining division saw the objective technical problem in the provision of a mere alternative to the flame retardant compositions of D1. Example 3 of D2 described a flame retardant polycarbonate resin composition comprising a sulfonate salt and octaphenylcyclotetra-siloxane, ie a cyclic siloxane according to Claim 1. Since D1 and D2 belonged to the same technical field, a skilled person would combine D1 and D2 in order to solve the technical problem and thus arrive at the claimed subject-matter.

III. On 13 September 2005, the appellant (applicant) filed a notice of appeal against the above decision with simultaneous payment of the prescribed fee.

A statement setting out the grounds of appeal was filed on 15 November 2005. The appellant requested that the decision under appeal be set aside and a patent be granted on the claims on file. Oral proceedings were requested as an auxiliary motion.

The arguments presented may be summarized as follows:

D1 did not disclose the cyclic siloxane as used in the present claims. Nor was there any disclosure or teaching in D1 regarding haze. There was no disclosure in D2 of a perfluoroalkane sulfonate and there was no disclosure or teaching of good haze values. As set out at page 4, lines 16-21 of the application, the use of a fire retardant component comprising a perfluoroalkane sulfonate and a cyclic siloxane in a polycarbonate resin composition resulted in a synergistic interaction of the fire retardant ingredients and additionally provided polycarbonate with reduced haze. As could be seen from Table 1B in the application as filed, the samples according to the invention (Samples 7-9 and 10-12) showed a significant improvement in flame retardant properties expressed as the probability of a first time pass "p(FTP)" UL94 V0 over Comparative Samples 1-3. Similarly, a comparison of Comparative Samples 13-16 containing no siloxane with Samples 21-24 and 25-28 according to the invention showed a significant improvement in p(FTP) for the latter (Tables 1C and 1D).

Since cyclic siloxane alone provided little improvement in fire retardant properties (page 5, lines 26-29) and perfluorobutane sulfonate (KPFBS) on its own showed a small improvement (Comparative Samples 1-3), the appellant therefore considered that there was a synergistic effect when KPFBS and a cyclic siloxane were used in combination. Furthermore, experiments using potassium diphenylsulfone sulfonate (KSS) and cyclic siloxane did not show an enhancement of the fire

retardant performance (page 5, lines 28-29). Thus, it would not be obvious that a combination of a perfluoroalkane sulfonate with a cyclic siloxane would provide greatly improved flame retardant performance. There was no suggestion to combine and modify D1 and D2 in an attempt to arrive at the claimed subject-matter.

- IV. In a communication dated 19 December 2007, the board questioned the novelty of the claimed subject-matter in view of D3 (Patent Abstract of Japan relating to JP 06 306265 A, cited in the International Search Report). Further, an inventive step objection was raised in view of D3 and D4 (EP 0 918 073 A2, cited in the International Search Report).
- V. In its reply dated 28 April 2008, the appellant filed an amended set of claims where the claimed subject-matter had been further limited by indicating the amounts for the perfluoroalkane sulfonate and the cyclic siloxane. Furthermore, the appellant provided arguments and evidence (English translation of D3, product information on silicones from ShinEtsu, product lists from ShinEtsu) as to why the claimed subject-matter was novel D3 and inventive over D3 and D4.
- VI. In a communication dated 17 July 2008 accompanying a summons to oral proceedings, the board objected *inter alia* to the newly introduced concentration ranges for the perfluoroalkane sulfonate and the cyclic siloxane in Claim 1. Specifically, the lower limits of these concentration ranges were only supported by individual examples and the respective values disclosed in the examples appeared to be associated with the other features of these examples.

VII. With a letter dated 15 September 2008, the appellant filed a main request and 1<sup>st</sup> and 2<sup>nd</sup> auxiliary requests.

(a) Claim 1 of the main request read as follows:

"A composition comprising polycarbonate resin, and a fire-retardant component comprising a perfluoroalkane sulfonate and a cyclic siloxane, wherein the cyclic siloxane is octaphenylcyclotetrasiloxane."

(b) Claim 1 of the 1<sup>st</sup> auxiliary request corresponded to Claim 1 of the main request except that the following wording was added at the end of the claim:

"..., wherein the perfluoroalkane sulfonate is present in an amount of from 0.07 to 0.1 phr relative to the composition as a whole, and the octaphenylcyclotetrasiloxane is present in an amount greater than 0.05 phr and less than or equal to 0.3 phr relative to the composition as a whole."

(c) Claim 1 of the 2<sup>nd</sup> auxiliary request corresponded to Claim 1 of the main request except that the following wording was added at the end of the claim:

"..., wherein the perfluoroalkane sulfonate is present in an amount of from 0.07 to 0.1 phr relative to the composition as a whole, and wherein when the polycarbonate resin is a linear

polycarbonate the amount of octaphenylcyclotetra-siloxane is 0.01 to 0.3 phr relative to the composition as a whole or when the polycarbonate resin comprises a mixture of linear and branched polycarbonates the amount of octaphenylcyclotetra-siloxane is 0.05 to 0.3 phr relative to the composition as a whole."

- (d) As regards the amounts for the perfluoroalkane sulfonate and the octaphenylcyclotetrasiloxane, the appellant argued that these were limited ranges with respect to the originally disclosed ranges whereby the lower limits were supported by the examples. In particular, the lower limit for the siloxane stated as being "greater than 0.05 phr" was supported by the disclosure at page 2, line 18 "of at least 0.02" in combination with the examples showing good flame retardant and haze performance.

VIII. In a communication dated 22 September 2008, the board pointed out that Claim 1 of the main request defined a composition of substantially the same scope as in Claim 1 as originally filed except that the nature of the cyclic siloxane had been limited to that originally referred to in the decision under appeal as being disclosed in D2, namely octaphenylcyclotetrasiloxane. A review of the file indicated that a principal reason for the refusal of the application by the examining division was the absence of any adequate evidence to support the allegation of a synergistic effect between the perfluoroalkane sulfonate and the cyclic siloxane. In particular, there was no example representing the state of the art according to D1 or D2. Since, further,



the evidence for a relevant effect in the application in suit was inadequate, there would seem to be no justification for departing, in relation to the claimed subject-matter, for the statement of problem adopted in the decision under appeal, namely that of a mere alternative for a fire-retarding composition, with the result that the finding of lack of inventive step in that decision would appear still to be valid.

As regards the lower limit for the perfluoroalkane sulfonate and octaphenylcyclotetrasiloxane, these amendments were considered to contravene Article 123(2) EPC. The same objection applied, *mutis mutandis*, to the 2<sup>nd</sup> auxiliary request. Further, neither did either of the auxiliary requests appear to include any limiting feature which would justify the recognition of an inventive step in their subject-matter.

- IX. In a letter dated 3 October 2008, the appellant informed the board that it would not attend the oral proceedings scheduled for 14 October 2008. Nevertheless, it maintained the request for oral proceedings and requested that a decision be taken based on the facts on file.
- X. On 14 October 2008, oral proceedings were held before the board, where the appellant (as announced) was not represented. Since it had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 115(2) EPC.

## Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Amendments

Claim 1 of the main request (point VII(a), above) defines a composition of substantially the same scope as in Claim 1 rejected by the examining division, except that the nature of the cyclic siloxane has been limited to octaphenylcyclotetrasiloxane. This amendment is based on, for example, page 4, line 1 of the application as filed. Since, furthermore, also the remaining claims are based on the application as filed, no objections under Article 123(2) EPC arise against the claims of the main request.

2.2 Novelty

The examining division has not raised a novelty objection with respect to the prior art cited in the International Search Report. Nor sees the board a reason to raise an objection in this connection, in particular because the appellant has provided convincing evidence (point V, above) that the claimed subject-matter is also novel over D3.

2.3 Inventive step

2.3.1 As indicated in the first paragraph of the application as filed, "in order to safely utilize polycarbonates in many applications it is necessary to include additives

which retard the flammability of the material and/or which reduce dripping. The challenge is to identify additives which accomplish this purpose without compromising the desirable properties of strength and clarity, without introducing new problems (such as the potential environmental problems associated with halogenated additives) and without prohibitively increasing the price."

- 2.3.2 D1 discloses a flame retardant polycarbonate resin composition which comprises 100 parts by weight of an aromatic polycarbonate resin (A), 0.01 to 0.5 parts by weight of at least one metal salt selected from the group consisting of an alkali metal salt of a perfluoroalkanesulfonic acid and an alkaline earth metal salt of a perfluoroalkanesulfonic acid (B), and 0.03 to 5 parts by weight of an organopolysiloxane containing organoxysilyl group(s) bonded to a silicon atom through a divalent hydrocarbon group (C), said metal salt and said organopolysiloxane being compounded into said polycarbonate resin. Although component (C) may be cyclic (page 6, line 44 of D1), the organopolysiloxane (C) is structurally different from octaphenylcyclotetrasiloxane required in Claim 1 of the main request.

The polycarbonate resin composition of D1 overcomes the environmental problem associated with bromine-based flame retardants, is excellent in flame retardancy and capable of preventing dripping thereof at the time of combustion of a thin-walled material made from the composition, while precluding the deterioration of the mechanical properties such as impact resistance as well as dimensional stability that are inherent in

polycarbonate (page 2, lines 38-42). Hence, D1 not only has most of the technical features in common with the claimed subject-matter, it also discloses technical effects and intended use most similar to the claimed subject-matter. Consequently, the board, just as the examining division in the decision under appeal, regards D1 as the closest prior art.

- 2.3.3 The next step in the "problem and solution approach" is the formulation of the objective technical problem based on an assessment of the technical effects provided by the claimed invention over the closest prior art.

The appellant alleged that the use of a perfluoroalkane sulfonate and the cyclic siloxane resulted in a synergistic interaction between the fire retardant ingredients and reduced haze referring in this connection to the statement at page 4, lines 16-21 and the experimental data in the application as filed. However, the data in the application as filed are not adequate evidence to support the presence of a synergistic effect or an improvement in haze over the closest prior art due to the use of a perfluoroalkane sulfonate in combination with the cyclic siloxane, in particular octaphenylcyclotetrasiloxane. Comparative Samples 1-3 in Table 1A of the application as filed contain only a perfluoroalkane sulfonate but no siloxane at all. Therefore, these examples do not represent the closest prior art, ie D1, which already discloses the combination of a perfluoroalkane sulfonate and a siloxane. Consequently, Comparative Samples 1-3 are in principle not suitable to demonstrate any technical effect over the closest prior

art, be it a synergistic effect in fire retardancy or an improvement in haze. This absence of any adequate evidence to support the allegation of a synergistic effect between the perfluoroalkane sulfonate and the cyclic siloxane was a principal reason for the refusal of the application by the examining division (decision under appeal, reasons 3.3). Although the board emphasised this point in the communication dated 22 September 2008, no further evidence for a relevant effect has been submitted by the appellant.

As regards the appellant's arguments in the statement of grounds of appeal, with reference to the application as filed at page 5, lines 28-29, (i) that cyclic siloxanes alone provide little improvement in fire retardant properties, and (ii) that experiments using potassium diphenylsulfone sulfonate (KSS) and cyclic siloxane did not show an enhancement of the fire-retardant performance are not convincing in the absence of relevant evidence, eg in the form of concrete experimental data. Again, such data have not been provided by the appellant.

In connection with the alleged synergistic effect it was noted by the board in the communications issued on 17 July 2008 and 22 September 2008 that the flame retardancy properties of some of the claimed compositions, namely the compositions of Samples 17 and 19 in Table 1C of the application as filed, were worse than the corresponding compositions not containing the octaphenylcyclotetrasiloxane, ie Samples 13 and 15. Thus, apart from the fact that the alleged synergistic effect has not been demonstrated over the closest prior art, it appears also that the

alleged synergistic effect - if it were present - is not achieved over the whole range claimed. Therefore, also for the latter reason, the effect cannot be used to define the objective technical problem to be solved. Regarding this objection, the appellant provided no counterarguments at all.

In summary, there is no justification for departing, in relation to the presently claimed subject-matter, from the statement of problem adopted in the decision under appeal, namely that of a mere alternative for a fire-retarding composition as disclosed in D1.

- 2.3.4 Starting from D1 and trying to solve the posed problem, ie providing alternative fire-retarding compositions, the person skilled in the art would of course consider the use of other siloxanes as possible additives, especially because it was known that siloxanes act as non-dripping agents in flame retardant polycarbonate compositions. D2, for example, discloses the addition of siloxanes, *inter alia* octaphenylcyclotetrasiloxane (column 1, lines 56-57; Example III of D2) to a polycarbonate composition comprising an organic alkali metal salt or an organic alkaline earth metal salt as flame retardant additive in order to render the polycarbonate composition non-dripping. Since D1 and D2 belong to the same technical field and even address the same effects, namely flame retardancy in combination with reduced dripping, the person skilled in the art would (not just could) combine D1 and D2 and arrive at something falling within the scope of Claim 1 of the main request. Hence, the subject-matter of Claim 1 is obvious from a combination of D1 with D2.

2.3.5 Since Claim 1 of the main request does not meet the requirements of Article 56 EPC, the main request has to be refused.

3. *1<sup>st</sup> auxiliary request*

3.1 Claim 1 of the 1<sup>st</sup> auxiliary request (point VII(b), above) is further limited by indicating the amount of perfluoroalkane sulfonate (ie 0.07 to 0.1 phr relative to the composition as a whole) and the amount of octaphenylcyclotetrasiloxane (ie greater than 0.05 phr and less than or equal to 0.3 phr relative to the composition as a whole).

3.2 Claim 2 as originally filed discloses for the perfluoroalkane sulfonate an amount of from 0.02 to 0.1 phr relative to the composition as a whole, and for the cyclic siloxane an amount of at least 0.02 phr relative to the composition as a whole. Further, page 3, lines 14-15 of the application as filed discloses for the cyclic siloxane an amount of from 0.02 to 0.3 phr.

It is noted that a new lower limit of 0.07 phr for the perfluoroalkane sulfonate and 0.05 phr for the octaphenylcyclotetrasiloxane, in each case relative to the composition as a whole, has been introduced in Claim 1 of the 1<sup>st</sup> auxiliary request. In neither case, however, is there support for these amendments other than in the examples.

3.3 As regards the lower limit of 0.07 phr for the perfluoroalkane sulfonate, this value is indeed disclosed in Table 1A (Sample 6), Table 1B (Sample 9), Table 1C (Sample 17), Table 1D (Samples 21 and 25),

Table 2A (one sample) and Table 2B (one sample). However, although all these examples use a specific perfluoroalkane sulfonate, namely potassium perfluorobutane sulfonate (KPFBS), Claim 1 of the 1<sup>st</sup> auxiliary request has not been restricted to KPFBS.

The appellant has argued that the lower limit of 0.07 phr was disclosed for different types of KPFBS and with different amounts of cyclic siloxane which conveyed to the skilled person the general teaching that the amount was not associated with the other features of the composition. However, the only variation with regard to KPFBS in the examples is that KPFBS from two different suppliers was used, namely 3M and Bayer. Furthermore, the arguments in support of generalising the disclosure of an example presented in the letter dated 15 September 2008 appear to rely at least in part on the fact that the samples using 0.07 phr of KPFBS showed good flame retardant and haze properties. But there is no evidence in the application in suit that the use of a perfluorobutane sulfonate other than KPFBS would provide the same good flame retardant and haze properties.

Hence, contrary to the appellant's assertion, the examples in the application as filed do not convey any technical teaching to the skilled person which would show that the results obtained in the examples are independent from KPFBS. Therefore, by not specifying the perfluoroalkane sulfonate as being KPFBS, the amendment of the lower limit for perfluoroalkane sulfonate has created a level of generality that was not present in the application as filed. Consequently, the range given in Claim 1 of the 1<sup>st</sup> auxiliary request



for the perfluoroalkane sulfonate does not meet the requirements of Article 123(2) EPC.

3.4 Under these circumstances there is no need further to investigate as to whether or not the range for octaphenylcyclotetrasiloxane has a proper basis in the application as filed which, at least as far as the term "greater than" is concerned, appears rather doubtful.

3.5 Quite apart from the above, Claim 1 of the 1<sup>st</sup> auxiliary request does not appear to include any limiting feature which would justify the recognition of an inventive step in the claimed subject-matter.

4. *2<sup>nd</sup> auxiliary request*

4.1 Claim 1 of the 2<sup>nd</sup> auxiliary request (point VII(c), above) is even further limited by indicating the amount of perfluoroalkane sulfonate (ie 0.07 to 0.1 phr relative to the composition as a whole) and alternative amounts of octaphenylcyclotetrasiloxane for a linear polycarbonate (0.01 to 0.3 phr relative to the composition as a whole) or a mixture of a linear and branched polycarbonate (0.05 to 0.3 phr relative to the composition as a whole).

4.2 Apart from the fact that the application as filed contains no teaching whatsoever that different amounts of octaphenylcyclotetrasiloxane have to be used for different types of polycarbonate resins, the objection raised against the lower limit of 0.07 phr for the perfluoroalkane sulfonate in Claim 1 of the 1<sup>st</sup> auxiliary request equally applies to Claim 1 of the 2<sup>nd</sup> auxiliary request (Article 123(2) EPC). Hence, for

this reason alone the 2<sup>nd</sup> auxiliary request has to be refused.

- 4.3 Further, also Claim 1 of the 2<sup>nd</sup> auxiliary request does not appear to include any limiting feature which would justify the recognition of an inventive step in the claimed subject-matter.

### **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young