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**Datasheet for the decision  
of 27 March 2009**

**Case Number:** T 0009/07 - 3.3.03

**Application Number:** 00916498.9

**Publication Number:** 1173510

**IPC:** C08K 5/521

**Language of the proceedings:** EN

**Title of invention:**

Polyphenylene ether resin concentrates containing organic phosphates

**Applicant:**

Sabic Innovative Plastics IP B.V.

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty - Main Request (no)"

"Inventive step - Auxiliary Request (no)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0009/07 - 3.3.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.03  
of 27 March 2009

**Appellant:** Sabic Innovative Plastics IP B.V.  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office dated 28 June 2006 and  
posted 1 August 2006 refusing European patent  
application No. 00916498.9 pursuant to  
Article 97(1) EPC 1973.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** A. Däweritz  
C. Vallet

## Summary of Facts and Submissions

- I. European patent application No. 00 916 498.9 with the title "Polyphenylene ether resin concentrates containing organic phosphates", filed as International patent application PCT/US00/07169 on 17 March 2000 and claiming the priority of 2 April 1999 of an earlier application in the U.S.A. (09/285574), was refused by a decision of the Examining Division dated 28 June 2006 and issued in writing on 1 August 2006. The decision was based on a Main Request and four Auxiliary Requests, each containing a set of five claims as annexed to the decision.

Any reference herein below to passages in the initial application text as published in WO-A-00/59995 will be given in *underlined italics*, eg Claim 1. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973". Polyphenylene ether will be abbreviated to "PPE".

The Main Request before the Examining Division read as follows:

1. A process for the manufacture of a polyphenylene ether thermoplastic composition comprising:

precompounding a solid concentrate comprising a polyphenylene ether resin and at least 5% by weight of an organic phosphate compound, based upon the weight of the polyphenylene ether resin in the concentrate, wherein the concentrate has less than 5 % by weight of particles less than 75  $\mu\text{m}$  (microns) in size; and compounding the solid concentrate, optionally with a polymer of an alkenylaromatic compound.

2. The process of claim 1, wherein the concentrate has essentially no particles less than 75  $\mu\text{m}$  (microns) in size.

3. The process of claim 1, wherein the concentrate contains at least 15% by weight of the organic phosphate compound based upon the weight of the polyphenylene ether resin in the concentrate.

4. The process of claim 1, wherein at concentrate contains at least 20% by weight of the organic phosphate compound based upon the weight of the polyphenylene ether resin in the concentrate.

5. The process of claim 1, wherein the polyphenylene ether resin is present from 5 to 70 percent by weight based upon the weight of the entire composition.

Since the first Auxiliary Request, which had been refused for lack of novelty, and the second and third Auxiliary Requests, both refused for violation of "Article 123 EPC" 1973 (pages 6 and 7 of the decision), were later withdrawn (see section IV, below), they will not be further considered here. The fourth Auxiliary Request, which had been filed at the oral proceedings before the Examining Division on 28 June 2006 in order to meet the objections under Article 123 EPC against the second Auxiliary Request, differed from the above Main Request only by the wording of its Claim 1, as can be seen from the clean copy filed with a letter dated 10 May 2007:

1. A process for the manufacture of a polyphenylene ether thermoplastic composition comprising:

preparing a concentrate comprising a polyphenylene ether resin and at least 5% by weight of an organic phosphate compound, based upon the weight of the polyphenylene ether resin in the concentrate; forming the concentrate into pellets having a size of 3mm x 3mm or ground to a particle size of less than about 3mm x 3mm; and compounding the concentrate optionally with a nonelastomeric polymer of an alkenylaromatic compound.

II. Claim 1 of the application as filed had read as follows:

1. A process for the manufacture of a thermoplastic composition containing:

a) at least one a polyphenylene ether resin, and [sic]

b) at least one polystyrene resin;

wherein the process comprises a concentrate of polyphenylene ether resin with an organic phosphate compound wherein the concentrate has less than 5% by weight of particles less than about 75 microns in size.

According to page 1, lines 11 to 16, "The concentrate comprises less than about 1% by weight particles less than about 75 microns in size, and preferably essentially no particles less than about 75 microns in size. The concentrate allows for ease of handling of polyphenylene ether resin without the risk of dust ignition while obtaining substantially the same physical properties as obtained with polyphenylene ether powder." and, according to page 2 (lines 12 to 19 and line 22 to page 3, line 2), "Particles less than about 75 microns in size are believed to lead to dust explosion hazards. Consequently these powders require special handling procedures to control dust and potential spark ignition hazards associated with such powders. ... It would be commercially advantageous to be able to ship PPE to various locations around the world for compounding into resin compositions to would serve local market needs. ... Conversion of PPE powder using standard compounding extruders followed by pelletization of the extrudate to obtain pellets having dimensions of about 3 mm by 3 mm has been attempted ... Unfortunately, the physical properties of many resin compositions made using the pellets are inferior as compared to control compositions made with PPE powder and the pellets must be ground to a smaller size in order to obtain physical properties that closely approximate those of control compositions. ... there continues to be a need for improved processes to manufacture resin compositions containing PPE."

III. In the decision of the Examining Division, reference was made *inter alia* to the following documents

D3: EP-A-0 611 798,

D5: the Patent Abstract of Japan of JP-A-09-040 858,

E1: JP-A-09-040 858 (in fact, the computer translation thereof into English as provided by the Japanese Patent Office) and

E3: Ullmann's Encyclopedia of Industrial Chemistry, Volume B8, "Environmental protection and industrial safety", 5th Edition, VCH Verlagsgesellschaft Weinheim, 1995, page 336.

(1) Whilst D3 and D5 had been mentioned in the International Search Report, E1 and E3 had been referred to in a submission of a third party under Article 115(1) EPC 1973, dated 27 June 2005.

(2) In view of this state of the art, the subject-matter of the Main and of the fourth Auxiliary Request was found to lack inventive step.

(3) Thus, it was held with regard to the Main Request that D3 appeared to disclose *"all features of independent claim 1 on file except the explicit teaching of the compounding step and the avoidance (or less than 5%) of particles having a diameter less than 75 micrometer."*

*However, it is obvious for the skilled person to compound the resin composition according to D3 since a compounding step of PPE compositions is state of the art. In addition, it would appear that no special technical effect is related to such compounding.*

*In addition, document E3 clearly teaches that 'the probability of a dust explosion is highest for very fine dusts (particle diameter less 63 micrometer)', see E3, page 336, middle of the left column."*

(4) Furthermore in a second approach, the Examining Division held that E1 represented the closest prior art

because its disclosure *"refers to a compounding step (masterbatch) and the preparation of a blend of PPE, organic phosphoric acid esters, a pelletising step and the technical problem of flame resistance."*, that the abstract disclosed the use of a PPE resin masterbatch for flame resistance and the blending of a phosphoric acid ester in an amount of 5 to 60%, that paragraph [0076] mentioned the preparation of pellets and Table 2 of E1 implied a compounding step. According to the Examining Division, *"the disclosure of document E1 lacks the teaching that fine particles as defined according to present claim 1 must be avoided."*

*Again, it belongs to the standard knowledge of the skilled person that such small particles must be avoided in order to prevent dust explosions. In addition, document E3 refers to this fact."*

(5) With regard to Claim 1 of the fourth Auxiliary Request, the Examining Division took the view *"that the technical difference between independent claim 1 under consideration and E1 is the size of the pellets, namely the pellets having a size of 3mm\*3mm or 'ground into particle size of less than 3mm\*3mm' (for original disclosure see page 12 of the original specification, line 16)"*. Furthermore, it was, however, held that no specific technical effect was related to the pellet form, which had been *"defined as 'regular' throughout the description"*, and that *"the subject-matter of independent claim 1 simply defines another process without any inventive."*

*Improved physical properties are obtained by the mere fact that a concentrate is prepared irrespective of its particle size - cf. Samples 24, 25, 28 and 29 at Table 3"*.

(6) Accordingly, the Examining Division concluded, that neither the Main Request nor any of the auxiliary requests complied with the requirements of the EPC 1973 and, therefore, the application was refused under Article 97(1) EPC 1973.

IV. On 28 September 2006, a Notice of Appeal was filed against this decision by the Applicant. The prescribed fee was paid on the same day. The Statement of Grounds of Appeal (SGA) was received on 8 December 2006.

In the SGA, the Appellant disputed the decision under appeal and provided its arguments concerning inventive step of the subject-matter of the Main Request and Auxiliary Request 4, both of which requests were maintained, whilst the first to third Auxiliary Requests were withdrawn (see section I, above): "*With regard to inventive step, the problem which the present invention seeks to overcome is to provide a process for the manufacture of thermoplastic compositions comprising PPE resin wherein the PPE which is conventionally used in powder form is replaced with a form which allows ease of handling and transportation without the risk of dust ignition while obtaining substantially the same physical properties as obtained with the PPE resin powder*". In support of these arguments, the Appellant filed an Annex I showing 12 notched Izod impact strength values excerpted from Tables 1, 2 and 3.

Furthermore, according to the Appellant, "*Document E1 also discloses polyphenylene ether resins and organic phosphoric acid esters, which may be pelletized. The phosphoric acid ester is added in order to provide flame retardancy. There is no disclosure or suggestion*



*in E1 that the problems which the present invention seeks to overcome would be provided by this concentrate.*" (SGA, page 3, lines 6 to 10).

- V. On 9 July 2008, the transfer of the patent application to a new applicant was requested. The transfer (Rule 22 EPC) took effect on 16 August 2008.
- VI. On 16 January 2009, the Board issued a summons to oral proceedings scheduled for 27 March 2009.
- VII. By letter dated 16 March 2009, the Board was informed "that applicant and representative do not intend to attend oral proceedings in person."
- VIII. The oral proceedings were held as scheduled on 27 March 2009 in the absence of the Appellant (Rule 115(2) EPC).
- IX. According to the written file, the Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 5 of the Main Request as annexed to the decision under appeal (which had, according to the minutes, been submitted at the oral proceedings on 28 June 2006) or, in the alternative, on the basis of the fourth Auxiliary Request as filed with the letter dated 10 May 2007.

## Reasons for the Decision

1. The appeal is admissible.
2. Since the summons to the oral proceedings had been issued in due time, the Board decided to continue the proceedings in the absence of the Appellant (Rule 115(2) EPC; sections VI and VIII, above).

### *Main Request*

3. As mentioned in section IV, above, last paragraph, the Appellant conceded that E1 disclosed the preparation of concentrates of PPE resins and organic phosphate flame retardants and that these concentrates could be formed into pellets.
  - 3.1 Furthermore, Claim 1 of E1 and the abstract D5 show that E1 relates to a mixture of (A) 100 parts by weight PPE resin and (B) 1 to 60 parts by weight of a flame retarding masterbatch suitable for the preparation of films or sheets. The masterbatch is based on 100 parts by weight of PPE resin and/or polystyrene resin and 5 to 60 parts by weight of a phosphoric acid ester, ie in the terms in the patent in suit, an organic phosphate.

Paragraphs [0070] and [0071] of E1 refer to three organic phosphates, which fulfil the definitions of either formula (III) on page 7, line 11 or the second formula on page 8, line 5 and which were, as described in paragraph [0076], melt-blended either with PPE or with PPE, GPPS and HIPS (ie PPE and two types of polystyrene resins), by means of a commercial twin-screw extruder. The extrudates of the concentrates thus obtained were then, after cooling, cut to pellets named masterbatches "MB-1" to "MB-6" in Table 1 of E1.

In the Board's opinion, it is self-evident that this pelletisation prevented the formation of fines, ie of particles having sizes of less than 75  $\mu\text{m}$  (0.075mm).

3.2 According to the description of E1's examples in [0077] and the recipes of the individual examples shown in Table 2, each of the above masterbatches was, in the manufacture of the respective final composition, melt-kneaded in a twin screw extruder with additional PPE and, optionally, GPPS and/or HIPS and, optionally, further resins (HTR and/or MHTR, cf. [0064] and [0067] to [0069]). Finally, films were made from pellets, obtained from these extrudates, by film extrusion.

3.3 From the description in paragraphs [0076] and from Table 2 of E1, it is evident to the Board that both the concentrates in the form of pellets and the final compositions obtained therefrom in these examples of E1, as considered above, not only complied with the compositional requirements of Claim 1 of the Main Request, but that each of the concentrates furthermore contained, according to the method used for their production, less than 5 % by weight of particles of less than 75  $\mu\text{m}$  (cf. the reference to pellets quoted in section II, above). Therefore, the Board takes the view that each one of the Examples 1 to 8 of E1's Table 2 fulfilled the requirements of present Claim 1.

3.4 It follows that the subject-matter of Claim 1 is not novel with regard to the disclosure of E1.

4. Consequently, the question of a further effect due to the concentrates being formed into pellets does not arise with regard to the Main Request.

*Fourth Auxiliary Request*

5. Claim 1 of this auxiliary request differs in two substantive aspects from Claim 1 of the Main Request:

(i) The claim no longer contains the previously mandatory feature that the concentrate has less than 5 % by weight of particles less than 75 µm in size.

(ii) Instead, it requires that the concentrate comprising the PPE and at least 5 % by weight of an organic phosphate be formed into pellets having a size of 3mm×3mm or ground to a particle size of less than about 3mm×3mm.

5.1 Due to this latter aspect, ie the addition of the definition concerning the particular size and form of the pellets formed from the PPE/phosphate concentrate to Claim 1 of this request, the question of lack of novelty over E1 does not arise, because E1 neither discloses the dimensions of the pellets described in its paragraph [0076], nor refers to ground particles of its concentrates (cf. section III(5), above).

5.2 Consequently, the question arises whether there is a technical effect associated with this additional requirement (ii) to the size and form of the concentrate in the claim (section 5, above).

5.2.1 According to page 7 (penultimate and last paragraphs) of the decision under appeal (section III(5), above), referring to this requirement, "There is no special technical effect related due the fact that the pellets have the specified form. In addition, those pellets are defined as 'regular' throughout the description which

in addition indicates that no special technical effect is related with this item."

5.2.2 This assessment was contested by the Appellant (section IV, above) on the basis of particle size data of Examples 24, 25, 28 and 29 in the amended version of Table 3 (annexed to the letter dated 6 August 2004).

5.3 Having regard to the amendments in Claim 1 as mentioned in section 5, above, it is evident to the Board that the new wording of the claim encompasses two different embodiments of the claimed process. On the one hand, the process refers to "forming the concentrate being formed into pellets having a size of 3mm x 3mm", and on the other hand, it refers to "ground to a particle size of less than 3mm x 3mm".

5.4 Furthermore, the description of the examples, which has served the Applicant as a sole basis for the above amendments of Claim 1 of the Auxiliary Request, gives rise to a number of further issues:

5.4.1 Firstly, "*Compositions were evaluated comparing PPE in the form of (1) powder (control), (2) ground into particle size of less than about 3 mm by about 3 mm, (3) pellets ... (mini), and (4) pellets having a size of 3 mm by 3 mm (regular).*" (page 12, lines 9 to 12).

5.4.2 Secondly, "*To contrast the compositions derived directly from PPE, concentrates of PPE with either HIPS or a phosphate flame retardant (...) were evaluated as either pellets having a size of 3 mm by 3 mm (regular) , or alternatively as ground into a particle size of less than about 3 mm by about 3 mm.*" (page 12, lines 12 to 17).

- 5.4.3 Thirdly, on page 12, lines 21 to 24, reference is made to the composition of "*The standard final formulation*".
- 5.4.4 In view of these formulations and the mentioning of the unsuccessful approaches to avoid explosion hazards without impairing the physical properties of PPE compositions on page 2, lines 10 to 30 (cf. section II, above), it is not clear what had, in fact, been *evaluated* in the various examples of Tables 1, 2 and 3.
- 5.4.5 Nor is it clear, in what form the PPE had been added to the extruder or, having regard to the above different conceivable forms in which the PPE could have been added to the extruder in the different examples, whether the terms of "*high*" or "*low*" energy input have a clear meaning which would allow a meaningful evaluation and comparison of the results of different examples. Further particulars concerning the preparation of the compositions investigated are also missing: the vacuum applied in the extruder, the residence time therein, the grinding conditions and the particle size distribution obtained in this step, where applicable, or where and when further additives had been added.
- 5.4.6 Moreover, the second alternative of aspect (ii) of the amendments in Claim 1, as mentioned in section 5, above, refers to material "*ground to a particle size of less than about 3mm x 3mm*", whereas the requirement that the concentrate contains less than 5 % by weight of particles of less than 75 µm has been deleted from the claim.

In view of the fact that "grinding" means the reduction of the size of particles to powder or small particles by friction or crushing, the new wording defining only

an upper limit of 3mm by 3 mm for the particle size of the ground concentrate does not, however, exclude the presence of particles exceeding a size of "*less than 75  $\mu$ m*" in an amount of above "*less than 5 % by weight*", contrary to the initial disclosure (cf. sections II and 5, above), which made it clear that this feature was essential for the success of the claimed process, ie for the prevention of dust explosion hazards (page 2, lines 10 to 13 and Claim 1; cf. section 5, above, aspect (i)). Hence, it is not clear, how the "*ground*" samples differ, for instance, from the "*powder control*" samples.

- 5.5 Consequently, there is no pair of examples differing only in the feature of whether or not PPE was added in the form of a concentrate with an organic phosphate flame retardant (cf. RDP in Table 3, page 17), whether worked up in the form of a pellet or "*ground*", which would enable a direct comparison leading to an unambiguous assessment of the effect of using a "*concentrate*" according to Claim 1 on the mechanical properties of the "*standard final formulation*".
- 5.6 Consequently, the crucial issue, (i) as presented in the application (cf. section II, above), (ii) as held in the decision under appeal (sections III(4) and III(5), above) and (iii) as argued by the Appellant (cf. section IV, above), can only and at most be seen in the answer to the question of whether and how the ignition hazard caused by PPE can be coped with. However, no experimental data have been provided for any one the examples in this respect. The general remark to this end, on page 10, lines 3 to 6, cannot remedy this deficiency. It is therefore, not evident from the experimental data in the application in suit that any

improvement would have been achieved with respect to the results reported in E1/D5.

6. Consequently, the problem to be solved with regard to document E1, the closest piece of prior art, can only be seen in the provision of an alternative way of preventing the dust explosion or ignition hazards caused by powdery PPE.
7. As investigated with regard to the Main Request, the only difference between the subject-matter of E1 and the claimed process of the application in suit resides in the particle size of the concentrate pellets or in the concentrate being ground to particle sizes of less than about 3 mm × 3 mm.
8. Document E1 itself does not provide any hint to a concentrate fulfilling this feature and cannot therefore suggest to solve the above problem in the way as proposed in Claim 1.

However, the explanation in the description (section II, above) is consistent with the common general knowledge as referred to in E3, page 336, middle of the left column, that "*the probability of a dust explosion is highest for very fine dusts (particle diameter < 63 µm). ... Handling or processing of coarser product may lead to the accumulation of fines (e.g. by abrasion) and thus to the formation of an explosible dust cloud.*"

This finding corroborates the correctness of the reasons concerning the inventive step issue in the decision under appeal as referred to in sections III(5) and 5.6, above.



9. Consequently, the Board has come to the conclusion that the subject-matter of Claim 1 of the fourth Auxiliary Request does not meet the requirements of Article 56 EPC. Since a decision can only be made on a request as a whole, but not on an individual claim, the fourth Auxiliary Request must, therefore, like the Main Request also be refused.
  
10. In summary, the Board concurs with the findings of the Examining Division that neither the Main Request nor the sole remaining Auxiliary Request do comply with the requirements of the EPC. Consequently, the appeal cannot be successful.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

M. Kiehl

R. Young