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**Datasheet for the decision
of 5 April 2017**

Case Number: T 0007/13 - 3.3.03

Application Number: 05718340.2

Publication Number: 1751214

IPC: C08G75/20, C08G75/23, C08L81/06

Language of the proceedings: EN

Title of invention:

AN IMPROVED PROCESS OF PREPARATION OF BLOCK COPOLYMERS AND THE
BLOCK COPOLYMERS PREPARED THEREFROM

Patent Proprietor:

SOLVAY SPECIALITIES INDIA PRIVATE LIMITED

Opponent:

BASF SE

Headword:

Relevant legal provisions:

EPC Art. 100(b), 56
RPBA Art. 13(1), 13(3)

Keyword:

Sufficiency of disclosure - (yes)
Inventive step - (yes)
Late-filed argument - admitted (no)

Decisions cited:

G 0003/14

Catchword:



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Case Number: T 0007/13 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 5 April 2017

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Decision under appeal: **Interlocutory decision of the Opposition**
Division of the European Patent Office posted on
29 October 2012 concerning maintenance of the
European Patent No. 1751214 in amended form.

Composition of the Board:

Chairman D. Marquis
Members: O. Dury
R. Cramer

Summary of Facts and Submissions

- I. The appeals by the patent proprietor and the opponent lie from the interlocutory decision of the opposition division posted on 29 October 2012 concerning maintenance of the European Patent No. 1 751 214 in amended form.
- II. A notice of opposition to the patent was filed requesting revocation of the patent in its entirety.
- III. In the contested decision the following documents were *inter alia* cited:
- D1: EP-A-0 479 192
 - D2: EP-A-0 243 831
 - D6: M.J. El-Hibri et al., Handbook of Thermoplastics, edited by O. Olabisi, Marcel Dekker, Inc., New York, 1997, Chap. 36, "Poly(aryl ether sulfone)s", 893-930
 - D7: H.R. Kricheldorf, Handbook of Polymer Synthesis, Part A, Marcel Dekker Inc., New York, 1992, Chap. 9, "Aromatic Polyethers", 556-614
 - D8: J. Devaux et al., Handbook of Polymer Synthesis, Part A, Marcel Dekker Inc., New York, 1997, Chap. 38: "Poly(aryl ether ketones-co-sulfones)", 951-973

According to that decision the patent in suit (main request) was held to satisfy the requirements of sufficiency of disclosure but lacked novelty. Auxiliary requests 1-7 were considered not to satisfy the requirements of Article 123(2) EPC. However, it was decided that the patent could be maintained in amended form according to the eighth auxiliary request (two

claims) filed during the oral proceedings of 12 June 2012. In that respect, an inventive step was in particular acknowledged starting from D1 as closest prior art.

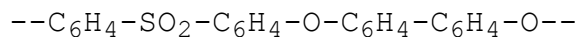
- IV. The patent proprietor (appellant 1) lodged an appeal against the above decision and, in its statement of grounds of appeal, requested that the decision of the opposition division be set aside and the patent be maintained on the basis of either the main request or the 1st auxiliary request filed therewith.
- V. The opponent (appellant 2) lodged an appeal against the above decision and requested that the decision of the opposition division be set aside and the patent be revoked. Simultaneously the following documents were *inter alia* filed:
- D11: Experimental report (5 pages)
 - D13: V. Percec et al., *Macromolecules*, 1993, 26, 3650-3662
 - D14: M.J. Jurek et al., *Polymer*, 1989, Vol. 30, August, 1552-1557
 - D15: S. Brenda and W. Heitz, *Macromol. Chem. Phys.*, 1994, 195, 1327-1339
 - D16: EP-A-0 450 791
- VI. In a communication dated 1 August 2016 the Board identified issues to be discussed at the oral proceedings to be held on 5 April 2017.
- VII. With letter of 10 January 2017 appellant 1 requested that the patent be maintained in amended form according to either the main request or any of the 1st to 3rd auxiliary requests filed therewith, whereby the main request was identical to the main request filed with

their statement of grounds of appeal.

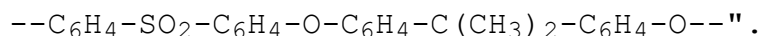
The 1st auxiliary request consisted in a set of four claims, of which the claims relevant to the present decision read as follows:

"1. Block copolymer comprising of at least two types of homoblock, all belonging to a family of polysulfones that are linked together to form block copolymer chains, wherein each of the homoblock has an identical or different molecular weight of at least 1000 and comprises at least 5 % of the overall weight of the block copolymer, and wherein the block copolymer has a molecular weight of at least 2000, wherein the homoblocks are PSU and PPSU, and wherein

(i) PPSU is polyphenylsulfone, of which the unit chain structure is :



(ii) PSU is polysulfones, of which the unit chain structure is :



"3. Block copolymer according to any one of claims 1 or 2, characterized in that the homoblocks are present in a random sequence."

"4. Block copolymer according to any one of claims 1 or 2, characterized in that the homoblocks are present in an alternating sequence."

Claim 2 was dependent on claim 1.

VIII. With letter of 16 March 2017 appellant 2 submitted additional arguments as well as the following

documents:

D17: H.G. Elias, An Introduction to Polymer
Science, 1st edition, 1997, 126-127

D18: US 6 228 970

IX. During the oral proceedings, which were held on
5 April 2017, appellant 1 withdrew the main request
filed with letter of 10 January 2017.

X. The arguments of appellant 1, as far as relevant to the
present decision, were essentially as follows:

1st auxiliary request - Sufficiency

(a) It was derivable from the patent in suit that the
molecular weight mentioned in the claims was the
number average molecular weight. It was further
disclosed in the patent in suit that the molecular
weights were determined using GPC and polystyrene
standards, which in combination with the skilled
person's general knowledge was sufficient to enable
the measurement of the molecular weight.

Also, appellant 2 had not shown that the alleged
ambiguity in the determination method of molecular
weight prevented the skilled person to prepare the
block copolymers being claimed. The experimental
conditions used in D11 were not illustrative of the
teaching of the patent in suit and, therefore,
could not demonstrate a lack of sufficiency.

(b) The other objections of lack of sufficiency had
been submitted for the first time less than two
weeks before the oral proceedings. There was no
reason why those objections could not have been

submitted earlier, in particular because i) they were only based on calculations and theoretical considerations and, thus, they did not require any experimental work and ii) they put in question the credibility of the examples of the patent in suit which had been on file since grant of the patent. In addition, appellant 2 had until then not reacted to the Board's communication, which had been sent well in advance of the oral proceedings. Appellant 1 did not have sufficient time to consider those objections, in particular because they were only submitted in German and because the inventors were based in India. Finally, none of those objections effectively showed that the block copolymers defined in claim 1 could not be prepared. For those reasons, those lines of argumentation should not be admitted to the proceedings.

1st auxiliary request - Inventive step

(c) The subject-matter of claim 1 differed from D1, which was the sole closest prior art considered by appellant 2, in that all the blocks should belong to a family of polysulfone that are linked together, which was not the case of the "modified" block copolymers of D1, in particular in view of the mandatory presence of the rests (c) defined in claim 1 of D1.

The technical problem to be solved was to provide copolymers which exhibit a combination of PSU properties such as easy processability and light colour properties with PPSU properties such as high temperature and impact resistance.

The solution resided in the block copolymers defined in operative claim 1 and the examples of the patent in suit showed that the above problem was indeed solved. The argumentation based on an alleged randomisation as indicated in D1 or D5 relied upon by appellant 2 was not supported by any evidence. There was also no evidence on file that the preparation processes used in the examples of the patent in suit did not lead to the block copolymers indicated in the patent in suit as alleged by appellant 2. Besides, operative claim 1 was not limited to long blocks but only required that the blocks had at least about 3 PSU or PPSU units. Therefore, the examples of the patent in suit showed that the problem defined above was effectively solved.

Contrary to appellant 2's opinion, none of D2, D6 to D8 effectively disclosed PSU/PPSU block copolymers. Therefore, neither D1 nor any of D6 to D8 contained a pointer to the subject-matter defined in operative claim 1, in particular not in order to solve the technical problem defined above.

XI. The arguments of appellant 2, as far as relevant to the present decision, may be summarised as follows:

1st auxiliary request - Sufficiency

(a) It was well known in the art that the determination of molecular weight by GPC could be carried out using different calibration standards and different solvents as mobile phase, as shown in e.g. D13 to D16. Besides, it was shown in D11 that using different solvents and/or mobile phase could lead to significantly different results in terms of

molecular weight. Therefore, the method of determination of the molecular weight was insufficiently disclosed in the patent in suit. As a consequence, the skilled person did not know when he was working within or outside the scope of the claims, which according to EPO case law amounted to a lack of disclosure.

- (b) It was further derivable either from the direct comparison of some of the data contained in the examples of the patent in suit, or from the comparison of those data with calculated values or common general knowledge related to molecular weight and/or polydispersity of block copolymers (see e.g. D17 and D18), that the GPC method used in the patent in suit must have been incorrect. In that respect, the skilled person was however not in a position to rework the examples of the patent in suit because of the lack of information regarding the determination method used in the patent in suit.

Although those latter objections were filed late in the proceedings they were merely based on data contained in the patent in suit or on usual calculation methods which a technically trained person should be able to deal with. It was to be noted that some of those issues arose during the preparation for the oral proceedings, in particular in relation to some issues identified in the Board's communication. Therefore it would not be justified not to admit those objections into the proceedings.

1st auxiliary request - Inventive step

(c) D1 was the closest prior art since it dealt, as the patent in suit, with block copolymers which could comprise PSU and PPSU blocks of similar molecular weight and amounts as defined in operative claim 1 and obtained by first preparing those blocks and then combining them together.

The subject-matter of operative claim 1 differed from D1 only in the specific combination of PSU and PPSU blocks, which was not explicitly disclosed in D1. In that respect, operative claim 1 did not impose that the PSU and PPSU blocks be directly linked together. Therefore, reading claim 1 in its broadest sense, other blocks or spacers could also be present between the PSU and PPSU blocks.

Considering that the patent in suit did not illustrate the subject-matter of the closest prior art, the technical problem effectively solved over D1 could at most reside in the provision of further, alternative block copolymers. However, it was even questionable if block copolymers as indicated in the examples of the patent in suit were effectively obtained since it was known from D1 (page 2, lines 26-33) that using the experimental conditions of the examples of the patent in suit the original block length of the parent homoblocks was not retained owing to a randomisation reaction induced by the synthesis. A similar teaching was indicated in D5 (page 252). That conclusion was confirmed by the high polydispersity obtained in the examples of the patent in suit.

It was also to be noted that operative claim 1 only imposed that the block copolymers comprised 5% of each of the PSU and PPSU blocks defined therein, thus leaving 90% of the copolymer undefined. It was not credible that any technical problem was solved over the whole scope of that claim.

Since PSU and PPSU were disclosed as possible alternatives in D1 and block copolymers comprising PSU and PPSU blocks were well known in the art as shown in D6, D7 and D8, the subject-matter of operative claim 1 was obvious in the light of D1 alone or in combination with any of D6 to D8.

Although D2 was not explicitly related to PSU/PPSU block copolymers but to PSU/PES block copolymers, it was taught therein that the problem of incompatibility between two homopolymers (here PSU and PES) was solved by preparing block copolymers having blocks made of each of the homopolymers. Therefore, the skilled person confronted with the problem of incompatibility between PSU and PPSU polymers would, following the teaching of D2, obviously arrive at the subject-matter of operative claim 1.

XII. Appellant 1 (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of any of the 1st to 3rd auxiliary requests, all filed with the letter of 10 January 2017.

Appellant 2 (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

1. Following the withdrawal of the main request filed with letter of 10 January 2017 during the oral proceedings before the Board, the effective highest ranking request defended by appellant 1 is the **1st auxiliary request filed with letter of 10 January 2017.**
2. Sufficiency of disclosure
 - 2.1 In order to meet the requirements of sufficiency of disclosure, an invention has to be disclosed in a manner sufficiently clear and complete for it to be carried out by the skilled person without undue burden on the basis of the information provided in the patent specification and, possibly, common general knowledge. This means in particular in the present case that the skilled person should be able to prepare block copolymers according to independent claim 1.
 - 2.2 In order to prepare said block copolymers, information is provided in the patent in suit in respect of
 - The preparation of homoblocks made of PPSU and PSU units according to features (i) and (ii) of claim 1 (paragraphs 8-10, 19, 20 and 35-37 of the patent in suit), also referred to as "parent homoblock";
 - The reaction of said parent homoblocks to prepare a block copolymer (paragraphs 54-56, 59 and 60 of the patent in suit);
 - The importance of specific endgroups functionalities, endgroups stoichiometry and/or

homoblocks stoichiometry (paragraphs 23, 28, 30, 39, 43 and 45 of the patent in suit);

Also, specific PPSU/PSU block copolymers are prepared in examples 1-4, 6-8 and 19-20 of the patent in suit.

2.3 Appellant 2 argued that although it was indicated in the patent in suit that the molecular weights mentioned in claim 1 were measured by GPC, it was known in the art that GPC could be carried out using different calibration standards and different solvents as mobile phase and that it was shown in D11 that this could lead to significantly different results.

2.3.1 In that respect it is correct that it is explicitly stated in the patent in suit that molecular weights can be determined using GPC (paragraphs 48 and 52). However, it is further indicated in the examples that calibration is made using polystyrene standards (see e.g. page 9, lines 51-52; polystyrene is also used in other examples (either for PPSU or PSU homoblocks or the whole block copolymer see e.g. paragraphs 74, 77, 79, 104) and no other calibration standard is used). Considering that sufficiency of disclosure has to be established on the basis of the patent in suit as a whole, it is concluded that the patent in suit teaches to determine molecular weights by GPC using polystyrene as calibration standards.

2.3.2 It is correct that it is disclosed in each of D13 to D16 that different mobile phases may be used when using polystyrene calibration standards for determining the molecular weight of sulfonated polymers by GPC (D13: page 3651, right column, section "Techniques"; D14: page 1554, left column, first paragraph; D15: page 1329, last paragraph and footnote of Table 3; D16:

page 7, line 9). However, although the experimental data provided by appellant 2 in D11 contain various experiments carried out using several mobile phases with several standards, it contains a single experiment carried out using polystyrene as calibration standard i.e. according to the teaching of the patent in suit (see Table 1 on page 4 of D11). Therefore, in the absence of different experiments carried out with polystyrene as calibration standard and various mobile phases, the data of D11 cannot show the influence of the mobile phase when using polystyrene standards. As a consequence, it cannot be concluded in view of D11 that it was shown that significantly different results are obtained when using a GPC method according to the teaching of the patent in suit and using different solvents as mobile phase, as argued by appellant 2.

2.3.3 In addition, appellant 2's objection is related to the issue whether or not the molecular weights specified in claim 1 are unambiguously defined because of an alleged lack of information regarding the GPC determination method i.e. if the skilled person is in a position to determine whether or not he is working within the scope of the claims.

The question whether or not that issue effectively amounts to a lack of sufficiency or if it is an issue of clarity was the object of many decisions as indicated in Case Law of the Boards of Appeal of the EPO, 8th edition, 2016, II.C.4.5, 5.6.5, 5.6.8 and 7.2, some of which have been relied upon e.g. by appellant 2 in its statement of grounds of appeal. However, an ambiguity of a parameter in the claims is not enough in itself to deny sufficiency of disclosure and the question whether said ambiguity leads to insufficiency of disclosure is to be decided on a case-by-case basis

(see e.g. reference to T 2403/11 and T 608/07 on pages 338 and 359 in the Case Law, *supra*). Rather, with respect to sufficiency the relevant question is whether the patent in suit provides sufficient information which enables the skilled person when taking into account common general knowledge to reproduce the invention (see e.g. reference to T 466/05 on page 359 in the Case Law, *supra*).

In the present case, it is concluded in view of the considerations given in above sections 2.2, 2.3.1 and 2.3.2 that it was not shown that the alleged ambiguity relied upon by appellant 2 is so severe that it would prevent the skilled person from preparing a copolymer according to operative claim 1, i.e. that it amounted to a lack of sufficiency of disclosure. Rather, that issue could at most be related to a matter of clarity pursuant to Article 84 EPC, which however cannot be addressed at the present stage of the proceedings since the parameter in question is already present in the granted claims (see G 3/14, OJ EPO 2015, A102: catchword).

2.3.4 For those reasons, appellant 2's objection is rejected.

2.4 Two new lines of argumentation in respect of lack of sufficiency of disclosure were put forward in appellant 2's last written submission dated 16 March 2017, namely:

(i) an objection based on a comparison of the number average molecular weight determined experimentally in the examples of the patent in suit with calculated values, either for the homoblocks or the block copolymers; and

(ii) an objection based on the finding that the PPSU homopolymer of examples 1 and 2 of the patent in suit were prepared following the same process and using the same proportions of components but exhibited significantly different molecular weight (by number and by weight). The same was valid for the PSU homopolymers prepared in examples 4 and 6 of the patent in suit.

- 2.4.1 It was not contested by appellant 2, in particular during the oral proceedings before the Board, that those objections had only been submitted for the first time about three weeks before the oral proceedings before the Board (submission dated 16 March 2017 and filed on 17 March 2017; oral proceedings held on 5 April 2017), which is well after its statement of grounds of appeal. Therefore, those objections constitute amendments to appellant 2's case and their admittance to the proceedings undergo the stipulations of Article 13(1) and (3) RPBA.
- 2.4.2 In the present case, both objections (i) and (ii) are based on experimental data present in the patent in suit, optionally in comparison with theoretical calculations. Therefore, there is no apparent reason why those objections could not have been filed earlier in the appeal proceedings, in particular together with appellant 2's statement of grounds of appeal, which would have satisfied the stipulations of Article 12(2) RPBA according to which the parties should provide a complete case with their statement of grounds of appeal or their reply to it.
- 2.4.3 Appellant 2 argued that those objections were raised in reply to some issues identified in sections 10.3, 10.5 and 12.4 of the Board's communication. However, said

communication was sent to the parties on 1 August 2016 and no justification was provided by appellant 2 why those new lines of argumentation were not submitted earlier than 17 March 2017, e.g. in direct response to the Board's communication. Besides, section 10.3 of the Board's communication was directed to an issue of sufficiency in relation to a feature which is not present in the claims of the present 1st auxiliary request. Section 10.5 of the Board's communication was directed to the question whether appellant 2's former objection (see section 2.3) was a matter of clarity or sufficiency, which is not related to the new objections raised. Section 12.4 of the Board's communication was related to inventive step and also in respect of a feature which is not present in the claims of present 1st auxiliary request. Therefore, appellant 2's argument cannot be held to justify the filing of objections (i) and (ii) at such a late stage of the proceedings.

2.4.4 Even if, to appellant 2's benefit, the question could be posed why homopolymers apparently prepared according to similar conditions in the examples of the patent in suit seem to exhibit significantly different molecular weights, it appears questionable if this would be sufficient to amount to a lack of sufficient disclosure. In particular, it was not shown e.g. that the homopolymer blocks do not have a molecular weight of at least 1000 as specified in operative claim 1. Although the discrepancies relied upon by appellant 2 could raise doubts as to the values of the molecular weight indeed achieved in examples 1, 2, 4 and 6, it was not shown that those examples did not lead to a block copolymer according to operative claim 1 (see section 2.3.3 above). In view of the above it is thus concluded that it appears *prima facie* highly

questionable if appellant 2's objections (i) and (ii) may succeed.

2.4.5 Both objections (i) and (ii) further put into question for the first time the credibility of the experimental results contained in the patent in suit. The Board finds that appellant 1 could not have dealt with those objections submitted at such a short notice before the oral proceedings before the Board (17 March 2017 vs. 5 April 2017) without requiring adjournment of the oral proceedings, in particular considering that the submission was in German, a copy was not simultaneously sent to appellant 1 and consultations with the inventors residing in India might be necessary. Admitting those objections into the proceedings would therefore go against the stipulations of Article 13(3) RPBA.

2.4.6 Under such circumstances the Board finds it appropriate to exercise its discretion under Article 13(1) and (3) RPBA by not admitting into the proceedings the new objections in respect of lack of sufficient disclosure submitted for the first time in appellant 2's submission dated 16 March 2017. For the same reasons, also D17 and D18, which were submitted in support of those new objections, are not admitted into the proceedings.

2.5 The Board concludes from the above that the requirements of sufficiency of disclosure are met.

3. Inventive step

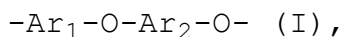
3.1 Closest prior art

3.1.1 The sole objection put forward by appellant 2 was based on D1 as closest prior art. Although appellant 1 considered that D6 constituted another possible starting point for the assessment of the inventive step, it was not contested, in particular during the oral proceedings before the Board, that D1 was also suitable. Therefore, the Board has no reason to deviate from the parties' view and D1 is considered as the closest prior art.

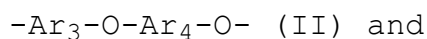
3.2 The distinguishing feature(s)

3.2.1 D1 deals with a polyarylene ether block copolymer which is modified with di- or triglycidyl compounds and which has a reduced viscosity of 0.2 to 1.8 dl/g, measured in a 1 % solution in dimethyl formamide, which copolymer comprises

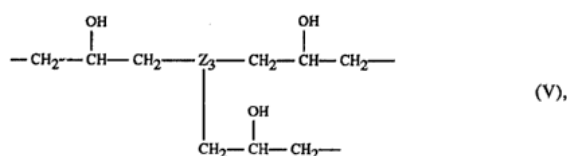
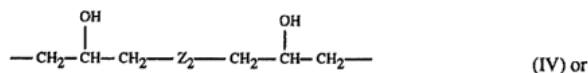
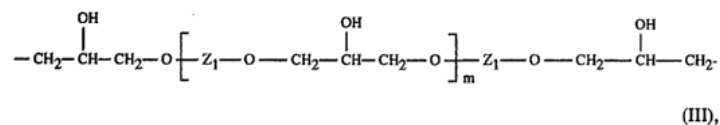
(a) 5-95 % by weight of polyarylene ether blocks having number average molecular weights of 1000-60 000 and containing identical or different structural repeating units of formula I



(b) 95-5 % by weight of polyarylene ether blocks different from (a) and having number average molecular weights of 1000-60 000 and containing identical, different or identical and different structural units of formula II



(c) 0.2-10 % by weight of identical or different structural units of formula III, IV or V



wherein Ar₁, Ar₂, Ar₃ and Ar₄ are each independently of one another a divalent carbo- cyclic-aromatic radical, Z₁ is a divalent radical of a cycloaliphatic, aromatic or araliphatic dihydroxy compound after removal of both hydroxyl groups, m is 0 or an integer from 1 to about 10, Z₂ is a divalent radical of a cycloaliphatic, aromatic or araliphatic di-secondary amino compound after removal of both N-hydrogen atoms, and Z₃ is a trivalent radical of a cycloaliphatic, aromatic or araliphatic compound carrying hydroxyl and/or amino groups after removal of hydroxy and/or active hydrogen atoms bound to amino nitrogen atoms, which radicals Ar₁, Ar₂, Ar₃, Ar₄, Z₁, Z₂ and Z₃ may be unsubstituted or substituted by one to four C₁-C₆ alkyl groups, C₃-C₁₀ alkenyl groups, phenyl groups or halogen atoms, and in which radicals Z₁, Z₂ and Z₃ one, two, three or four ring carbon atoms may be replaced by sulfur and/or nitrogen atoms,

and the sum of the polyarylene ether blocks (a) and (b) and of the structural units (c) together is 100 % by

weight (D1: claim 1).

- 3.2.2 As indicated on page 9 of the contested decision, the list of Ar₁ and Ar₃ groups on page 6, lines 1-25 of D1 includes groups of formula -C₆H₅-C₆H₅- and -C₆H₅-C(CH₃)₂-C₆H₅- which, in combination with the most preferred structure for Ar₂ and Ar₄ on page 7, lines 36-40 (-C₆H₅-SO₂-C₆H₅-) of D1 forms the unit chain structures of PPSU and PSU as defined in operative claim 1. However, in order to arrive at block copolymers comprising both PSU and PPSU blocks a twofold selection has to be made in the list on page 6, lines 1-25 whereby simultaneously Ar₂ and Ar₄ have to be chosen according to said most preferred embodiment.

Moreover, none of the examples on page 13 of D1 discloses a copolymer comprising homoblocks of PSU (see also the Table on page 14). Among those, example 5 of D1 is the most relevant since it discloses a modified block copolymer comprising a PPSU block (according to example D of D1) and a PES block (according to example A of D1).

- 3.2.3 During the proceedings the question arose whether or not the "modified block copolymers" disclosed in D1 are "block copolymers" according to claim 1.

In that respect it is indicated on page 10, lines 4-49 of D1 that the copolymers are prepared by first preparing parent homoblocks as follows: two kinds of hydroxyl terminated polyarylene ether blocks (Ia) and (IIa) and glycidyl terminated components of formula (IIIa), (IVa) or (Va). Those parent homoblocks are reacted together, whereby the initial length of the parent homoblocks is conserved (page 10, lines 46-49). Therefore the modified block copolymers according to D1

are bound to contain bridging groups (glycidyl compound according to structural unit (c) as defined in claim 1 of D1) which are neither PPSU, PSU nor a polysulfone between the homoblocks of formula (I) and (II) as defined in claim 1 of D1.

However the block copolymers according to operative claim 1 are defined *inter alia* in that they must comprise "at least two types of homoblocks, all belonging to a family of polysulfones that are linked together to form block copolymer chains". In the Board's view the wording "that are linked together to form block copolymer chains" itself imposes that the PPSU and PSU homoblocks are directly linked together and does not allow for the presence of any kind of intermediate unit in-between the PPSU and PSU blocks (e.g. spacers or other blocks). That reading of claim 1 is confirmed by the patent specification according to which the parent homoblocks are first prepared and then reacted together (see paragraphs 9, 10, 19, 20, 35-37, 55, 56, 59 and 60). Besides, it was also not shown that "random" and "alternating" block copolymers corresponding to the subject-matter of operative claims 3 and 4 would be compatible with the presence of bridging groups between blocks.

In that respect it is consistently indicated in D1 that the copolymers are "modified" block copolymers (claim 1; page 2, line 41; page 10, line 4; page 11, lines 29-31 and 34-35; page 12, line 25), establishing that the copolymers prepared are not usual block copolymers in the sense of the patent in suit wherein the blocks are directly linked to one another.

For those reasons, it is concluded that in the present case the modified block copolymers according to D1,

even if they were to comprise PPSU and PSU homoblocks, would not be block copolymers encompassed by operative claim 1.

3.2.4 As indicated in section 1, page 3 of the contested decision (first full paragraph), it was agreed by the parties that the molecular weights indicated in claim 1 are number average molecular weight, in particular following the information of 48 of the patent in suit. That issue was also not disputed during the appeal proceedings. Nor was it in dispute that the molecular weight given for the blocks according to claim 1 (a) and (b) of D1 fulfilled the requirements in terms of molecular weight indicated in operative claim 1 for the homoblocks ("at least 1000").

3.2.5 In view of the above, the block copolymers according to operative claim 1 differ from those of D1 in that they comprise simultaneously PSU and PPSU blocks and in that those blocks are "linked together to form block copolymer chains".

3.3 Technical problem effectively solved

3.3.1 Appellant 1 argued that the problem to be solved was to provide block copolymers exhibiting a combination of the good properties of PSU (processability, light colour) and PPSU (temperature and impact resistance) and being transparent, as indicated in paragraphs 1, 6 and 60 of the patent in suit.

3.3.2 Examples 1-4, 6-8 and 19-20 of the patent in suit deal with the preparation of PSU/PPSU block copolymers according to the teaching of the patent in suit and which are indicated to lead to block copolymers illustrating the subject-matter of operative claim 1.

In each of those examples the product prepared exhibits a single glass transition temperature (Tg) which is in-between the Tg of each single homoblock, which is indicated in the patent in suit as evidence that a block copolymer (as opposed to a physical blend of a PSU and a PPSU polymers) was prepared. This is confirmed by the data indicated in Tables 1 and 2 of the patent in suit (B-0 to B-6 corresponds to the copolymer prepared in examples 1-7; C-1 to C-3 correspond to blends according to comparative example 5, see paragraph 89 of the patent in suit). It is further indicated that said polymers are transparent. In view of the above, it may be derived from Tables 1 and 2 of the patent in suit that the properties of the copolymers are a compromise between those of each of the homopolymers.

3.3.3 Appellant 2's objection according to which it was known from either D1 (page 2, lines 26-33) or D5 (page 252) that using the experimental conditions of the examples of the patent in suit the original block length was not retained owing to a randomisation reaction is not supported by any evidence. Besides, it was not shown why that teaching would equally apply to the block copolymers defined in operative claim 1 which are of a different nature than those described in the documents relied upon by appellant 2 and which are prepared using different reaction conditions. For those reasons, that objection did not convince.

3.3.4 Similarly, appellant 2's objection according to which the high polydispersity obtained in the examples of the patent in suit indicated that the block copolymers prepared in those examples were not according to operative claim 1 is not supported by facts and cannot

be retained by the Board. It was in particular not demonstrated that such polydispersities were incompatible with homoblocks having a molecular weight of "at least 1000" according to operative claim 1.

- 3.3.5 Appellant 2 further argued that operative claim 1 only imposed that the block copolymers comprise 5% of each of the PSU and PPSU blocks defined therein, thus leaving 90% of the copolymer undefined. It was not credible that any technical problem could be solved over the whole scope of that claim.

However, also in that respect there is no evidence on file that the problem identified above is not solved over the whole scope of the claims, in particular when taking into account the definition of the block copolymers imposed by the wording of operative claim 1 (see section 3.2.3).

- 3.3.6 Appellant 2 further argued that no comparison with the block copolymers according to D1 were on file.

Although it is correct that no comparison with D1 was made, it is to be noted that D1 does not effectively disclose block copolymers but modified block copolymers (see section 3.2.3 above). Considering the formulation of the problem to be solved contemplated by appellant 1, a comparison with the closest prior art is in the present case not required in order to conclude that that problem is effectively solved.

- 3.3.7 In view of the above, the Board finds that the technical problem effectively solved is to provide block copolymers exhibiting a combination of the good properties of PSU and PPSU and being transparent, as proposed by appellant 1.

3.4 Obviousness

3.4.1 The question has to be answered whether the skilled person desiring to solve the above identified problem would, in view of the prior art, have modified the disclosure of the closest prior art in such a way as to arrive at the claimed subject matter. In particular, it has to be assessed whether there is any hint in the prior art to prepare block copolymers according to operative claim 1 in order to solve the technical problem defined in section 3.3.1 above.

3.4.2 Considering that D1 does not provide block copolymers *per se* but is rather directed to "modified" block copolymers which are not encompassed by the ambit of operative claim 1 (see section 3.2.3), D1 on its own cannot lead in an obvious manner to the subject-matter of operative claim 1.

3.4.3 D6 is a chapter of a textbook relating to poly(aryl ether sulfone)s in general, including PSU and PPSU (acknowledged in D6 as PSF and PPSF: see e.g. page 894). However, D6 fails to disclose block copolymers comprising PSU and PPSU homoblocks. Rather, only blends (i.e. physical mixtures) of PSU and PPSU are disclosed e.g. in section 4 on page 915 of D6.

3.4.4 D7 is a chapter of a textbook relating to aromatic polyethers in general, including aromatic poly(ether sulfones) (see e.g. Table 5 pages 564-565). Although appellant 2 argued that block copolymers were acknowledged on page 567 of D7, it was not shown that D7 effectively disclosed block copolymers comprising PSU and PPSU homoblocks.

The same is valid regarding D8, which is a passage of a textbook relating to poly(aryl ether ketones-co-sulfones), in which sequenced copolymers are mentioned at page 960, section IV.B, albeit no reference being made to block copolymers comprising PSU and PPSU homoblocks.

In view of the above and contrary to appellant 2's argumentation, neither D6, nor D7 nor D8 effectively discloses block copolymers comprising PSU and PPSU homoblocks linked together to form block copolymer chains according to operative claim 1. Therefore, the combination of D1 with any of D6 to D8 does not render the subject-matter of operative claim 1 obvious.

3.4.5 Appellant 2 did not dispute that D2 did not disclose block copolymers comprising PSU and PPSU homoblocks linked together to form block copolymer chains. Considering that it was concluded above that it was not shown that any of the other documents relied upon by appellant 2 effectively discloses block copolymers comprising PSU and PPSU homoblocks linked together according to operative claim 1, the combination of D1 with D2 cannot lead in an obvious manner to the subject-matter of operative claim 1.

3.5 Therefore, appellant 2's objection according to which the subject-matter of operative claim 1 is not inventive is rejected. For the same reasons, the subject-matter of claims 2-4, which are dependent on claim 1, is also inventive.

4. The 1st auxiliary request filed with letter of 10 January 2017 being allowable, it is not required that the Board considers any of the 2nd to 3rd

auxiliary requests filed with letter of
10 January 2017.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the 1st auxiliary request filed with the letter of 10 January 2017, and after any necessary amendment of the description.

The Registrar:

The Chairman:



B. ter Heijden

D. Marquis

Decision electronically authenticated