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**Datasheet for the decision
of 14 October 2015**

Case Number: T 2314/12 - 3.3.03

Application Number: 08017549.0

Publication Number: 2014718

IPC: C08L33/20, C08L65/00, C09D5/24,
H01B1/12, H01G9/00

Language of the proceedings: EN

Title of invention:
Conductive composition, and their production method

Patent Proprietor:
Shin-Etsu Polymer Co. Ltd.

Opponent:
Heraeus Precious Metals GmbH & Co. KG

Headword:

Relevant legal provisions:
EPC Art. 76(1), 123(2), 56
RPBA Art. 13(1)

Keyword:

Late filed auxiliary request - admitted (yes)
Divisional application - added subject-matter (no) - after
amendment
Inventive step - non-obvious alternative

Decisions cited:

G 0009/92, G 0004/93, G 0001/99, T 0856/92, T 0149/00,
G 0002/10

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 2314/12 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 14 October 2015

Appellant: Shin-Etsu Polymer Co. Ltd.
(Patent Proprietor) 1-9, Kanda-Sudacho
Chiyoda-ku
Tokyo 101-0041 (JP)

Representative: Berkenbrink, Kai-Oliver
Patentanwälte Becker & Müller
Turmstrasse 22
40878 Ratingen (DE)

Respondent: Heraeus Precious Metals GmbH & Co. KG
(Opponent) Heraeusstrasse 12-14
63450 Hanau (DE)

Representative: Herzog, Fiesser & Partner Patentanwälte PartG
mbH
Immermannstrasse 40
40210 Düsseldorf (DE)

Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
10 September 2012 concerning maintenance of the
European Patent No. 2014718 in amended form.**

Composition of the Board:

Chairman M. C. Gordon
Members: F. Rousseau
R. Cramer

Summary of Facts and Submissions

- I. European patent No. 2 014 718 in respect of European patent application No. 08017549.0 was granted as a divisional application of European patent application No. 04746313.8 published as EP-A-1 634 922.
- II. Claim 1 of the patent, which corresponded to claim 1 of the divisional application as filed and to claim 54 of the parent application as filed, read as follows:
- "1. A conductive composition comprising a conjugated conductive polymer and a polyanion: wherein the conjugated conductive polymer is at least one selected from the group consisting of polypyrroles, polythiophenes and polyanilines, and the polyanion is at least one selected from the group consisting of substituted or unsubstituted polyalkylene, substituted or unsubstituted polyalkenylene, substituted or unsubstituted polyimide, substituted or unsubstituted polyamide and substituted or unsubstituted polyester, and the polyanion comprises a constituent unit having an anion group and a constituent unit having no anion group, and also satisfies the relation: $m/n \leq 1$ where m represents the number of the constituent unit having an anion group and n represents the number of the constituent unit having no anion group."
- III. Notice of opposition was filed requesting revocation of said European patent in its entirety on the grounds that its subject-matter lacked novelty and inventive step (Article 100(a) EPC) and was insufficiently disclosed (Article 100(b) EPC).

IV. The following documents were, *inter alia*, cited in support of the opposition::

E1: EP-A-0 440 957

E2: EP-A-1 384 739

V. The decision of the opposition division, posted on 10 September 2012 was based on a main request submitted with letter of 18 May 2012 and an auxiliary request labelled "Auxiliary Request I" submitted during the oral proceedings on 20 June 2012.

Claim 1 and 7 of the main request read as follows:

"1. A conductive composition comprising a conjugated conductive polymer and a polyanion: wherein

the conjugated conductive polymer is at least one selected from the group consisting of polypyrroles, and polythiophenes, and

the polyanion is at least one selected from the group consisting of substituted or unsubstituted polyalkylene, substituted or unsubstituted polyalkenylene, and

the polyanion is a copolymer which is obtained by copolymerization of a monomer having an anion group and a monomer having no anion group,

the monomer having an anion group is selected from vinylsulfonic acid, vinylsulfonic acid salt, allylsulfonic acid, allylsulfonic acid salt, methallylsulfonic acid, methallylsulfonic acid salt, styrenesulfonic acid, 4-sulfobutyl methacrylate, 4-sulfobutyl methacrylate salt,

methallyloxybenzenesulfonic acid,
methallyloxybenzenesulfonic acid salt,
allyloxybenzenesulfonic acid, allyloxybenzenesulfonic
acid salt, styrenesulfonic acid salt,
 α -methylstyrenesulfonic acid, α -methylstyrenesulfonic
acid salt, acrylamide-t-butylsulfonic acid, acrylamide-
t-butylsulfonic acid salt, 2-acrylamide-2-
methylpropanesulfonic acid, 2-acrylamide-2-
methylpropanesulfonic acid salt, cyclobutene-3-sulfonic
acid, cyclobutene-3-sulfonic acid salt,
isoprenesulfonic acid, isoprenesulfonic acid salt,
1,3-butadiene-1-sulfonic acid, 1,3-butadiene-1-sulfonic
acid salt, 1-methyl-1,3-butadiene-2-sulfonic acid,
1-methyl-1,3-butadiene-3-sulfonic acid salt,
1-methyl-1,3-butadiene-4-sulfonic acid and
1-methyl-1,3-butadiene-4-sulfonic acid salt, and

the polyanion also satisfies the relation: $m/n \leq 1$
where m represents the number of the monomer having an
anion group and n represents the number of the monomer
having no anion group."

7. A method for preparing the conductive composition
according to claim 1, which comprises subjecting a
monomer of the conjugated conductive polymer to
oxidation polymerization in the presence of the
polyanion."

Claims 2 to 6 and claim 8 were dependent on claim 1 and
claim 7, respectively.

The claims of the auxiliary request differed from those
of the main request solely in that the wording "and
polythiophenes" had been deleted from claim 1, i.e. the
conjugated conductive polymer was defined to be at

least one selected from the group consisting of polypyrroles.

- VI. According to the interlocutory decision of the opposition division late filed documents, *inter alia* E10 (EP-A-0 575 291) submitted by the opponent and E14 (US-A-4 291 113) submitted by the patent proprietor were admitted into the proceedings. Moreover, amended claim 1 of the main request met the requirements of Article 123(2) EPC and Article 83 EPC, but lacked novelty over Example 10 of E1, while the patent as amended according to the documents of the auxiliary request met the requirements of the EPC.
- VII. The patent proprietor (hereinafter "appellant") filed a notice of appeal against the decision on 7 November 2012, the statement of grounds of appeal being filed on 18 January 2013. A main request, five auxiliary requests and comparative tests, hereafter referred to as E17 were submitted.
- VIII. The main request consisted of nine claims. Claim 1 was identical to that of the auxiliary request underlying the contested decision. Claim 2 was a newly filed independent claim reading as follows:
- "2. A conductive composition comprising a conjugated conductive polymer and a polyanion: wherein
- the conjugated conductive polymer is at least one selected from the group consisting of polythiophenes, and
- the polyanion is at least one selected from the group consisting of substituted or unsubstituted

polyalkylene, substituted or unsubstituted polyalkenylene, and

the polyanion is a copolymer which is obtained by copolymerization of a monomer having an anion group and a monomer having no anion group,

the monomer having an anion group is selected from vinylsulfonic acid, vinylsulfonic acid salt, allylsulfonic acid, allylsulfonic acid salt, methallylsulfonic acid, methallylsulfonic acid salt, styrenesulfonic acid, 4-sulfobutyl methacrylate, 4-sulfobutyl methacrylate salt, methallyloxybenzenesulfonic acid, methallyloxybenzenesulfonic acid salt, allyloxybenzenesulfonic acid, allyloxybenzenesulfonic acid salt, styrenesulfonic acid salt, α -methylstyrenesulfonic acid, α -methylstyrenesulfonic acid salt, acrylamide-t-butylsulfonic acid, acrylamide-t-butylsulfonic acid salt, 2-acrylamide-2-methylpropanesulfonic acid, 2-acrylamide-2-methylpropanesulfonic acid salt, cyclobutene-3-sulfonic acid, cyclobutene-3-sulfonic acid salt, isoprenesulfonic acid, isoprenesulfonic acid salt, 1,3-butadiene-1-sulfonic acid, 1,3-butadiene-1-sulfonic acid salt, 1-methyl-1,3-butadiene-2-sulfonic acid, 1-methyl-1,3-butadiene-3-sulfonic acid salt, 1-methyl-1,3-butadiene-4-sulfonic acid and 1-methyl-1,3-butadiene-4-sulfonic acid salt, and

the polyanion also satisfies the relation:
 $0.2 \leq m/n \leq 1$ where m represents the number of the monomer having an anion group and n represents the number of the monomer having no anion group."

Claims 3 to 9 had the same wording as claims 2 to 8 of the first auxiliary request underlying the contested decision, respectively, except that their reference to preceding claims had been adapted and that their back reference to claim 1 had been replaced by a reference to both claims 1 and 2.

- IX. The opponent (hereinafter respondent) submitted their rejoinder with letter of 18 July 2013. Experimental tests included in the body of that letter will be hereafter referred to as E18.
- X. The respondent requested with letter of 18 September 2014 transfer of the status of opponent of H. C. Starck Clevios GmbH, Im Schleeke 78-91, 38642 Goslar, Germany to the company Heraeus Precious Metals GmbH & Co. KG, Heraeusstasse 12-14, 63450 Hanau, Germany. Having regard to additional evidence and submissions in this respect made by the respondent with their letter of 13 March 2015, in response to a communication of the Board dated 4 December 2014, the parties were informed with a communication of the Board dated 2 July 2015 that the transfer of the status of opponent requested had been registered in the European Patent Register with effect of 16 March 2015. The appellant/patent proprietor did not raise objections against that transfer.
- XI. With letter of 6 January 2015 the appellant submitted two additional auxiliary requests labelled "Auxiliary Request 3a" and "Auxiliary Request 5a".
- XII. The respondent made further submissions with letter of 27 July 2015 (to which were attached documents E15 and E16).

XIII. Oral proceedings took place before the Board on 14 October 2015 during which an auxiliary request labelled "Auxiliary Request 0" was submitted. Claim 1 of that request was identical to claim 1 of the first auxiliary request underlying the contested decision. Claim 2 of "Auxiliary Request 0" read as follows:

"2. A conductive composition comprising a conjugated conductive polymer and a polyanion: wherein

the conjugated conductive polymer is at least one selected from the group consisting of polythiophenes, and

the polyanion is at least one selected from the group consisting of substituted or unsubstituted polyalkenylene, and

the polyanion is a copolymer which is obtained by copolymerization of a monomer having an anion group and a monomer having no anion group,

the monomer having an anion group is selected from vinylsulfonic acid, vinylsulfonic acid salt, allylsulfonic acid, allylsulfonic acid salt, methallylsulfonic acid, methallylsulfonic acid salt, styrenesulfonic acid, 4-sulfobutyl methacrylate, 4-sulfobutyl methacrylate salt, methallyloxybenzenesulfonic acid, methallyloxybenzenesulfonic acid salt, allyloxybenzenesulfonic acid, allyloxybenzenesulfonic acid salt, styrenesulfonic acid salt, α -methylstyrenesulfonic acid, α -methylstyrenesulfonic acid salt, acrylamide-t-butylsulfonic acid, acrylamide-t-butylsulfonic acid salt, 2-acrylamide-2-methylpropanesulfonic acid, 2-acrylamide-2-

methylpropanesulfonic acid salt, cyclobutene-3-sulfonic acid, cyclobutene-3-sulfonic acid salt, isoprenesulfonic acid, isoprenesulfonic acid salt, 1,3-butadiene-1-sulfonic acid, 1,3-butadiene-1-sulfonic acid salt, 1-methyl-1,3-butadiene-2-sulfonic acid, 1-methyl-1,3-butadiene-3-sulfonic acid salt, 1-methyl-1,3-butadiene-4-sulfonic acid and 1-methyl-1,3-butadiene-4-sulfonic acid salt, and

the polyanion also satisfies the relation:

$0.2 \leq m/n \leq 1$ where m represents the number of the monomer having an anion group and n represents the number of the monomer having no anion group."

Claims 3 to 9 correspond to those of the main request, but claim 3 refers to claim 1 only, and claim 4 refers to both claims 2 and 3.

XIV. The arguments of the appellant, insofar as relevant for the present decision, can be summarized as follows:

Main request

(a) When analysing whether the requirements of Article 76(1) or 123(2) EPC were met, one had to consider the subject-matters of claims 1 and 2 as a unit, which subject-matter had been split up into two claims merely for procedural reasons. The subject-matter of claims 1 and 2 of the main request corresponded to the 7th aspect of the invention which was defined in claim 54 and paragraph [0078] and described in detail in paragraphs [387] to [437] of the parent application as filed. Starting from claim 54 or paragraph [78] of the parent application, in order to arrive at the subject-matter defined by both claims together

it was necessary to delete the embodiment "polyanilines" from the list of conductive polymers and to restrict the group of polyanions to the group consisting of polyalkylenes and polyalkenylenes. A basis for this amendment could be found in paragraphs [0421] and [0388] of the parent application as filed. The relationship $0.2 \leq m/n \leq 1$ was disclosed in paragraph [405] of the parent application as filed. Consequently, the subject-matter of claim 2 of the main request met the requirements of Article 76(1) EPC.

"Auxiliary request 0"

- (b) "Auxiliary request 0" differed from the main request solely in that the embodiment that the polyanion is at least one selected from the group consisting of substituted or unsubstituted polyalkylene had been deleted. This amendment addressed the objections of the respondent according to which claim 2 of the main request did not meet the requirements of Article 76(1) EPC and Article 123(2) EPC.

- (c) Having regard to inventive step, the closest prior art was the composition of Example 10 of E1. E1 related to antistatic treatment of plastic mouldings and concerned polymerization of polythiophene in the presence of a polyanion. The subject-matter of claim 2 of "Auxiliary request 0" differed from the embodiment described in Example 10 of E1 only in that the copolymer had a m/n ratio in the range of 0.2 to 1, whereas the copolymer used in example 10 of E1 exhibited a m/n ratio of 0.016. Hence, taking also structural considerations into account, Example 10 of E1 was

the closest prior art. As shown by the experimental data of E17, which presented a comparison of the copolymer used in Example 10 of E1 with copolymers according to operative claim 2, the objective technical problem to be solved by the present invention could be regarded as providing improved compositions with enhanced electrical conductivity and solubility. If one considered, however, that the closest prior art was represented by conductive compositions obtained with polystyrene sulfonic acid as doping agent as disclosed in E1, the technical problem solved by the present invention could be regarded as being to provide further compositions allowing to achieve a compromise between stability, solvent solubility and content of residual ions.

- (d) E1 taught polyanion copolymers in general, but not copolymers having the m/n ratio defined in operative claim 2. In addition, the specific copolymer disclosed in Example 10 of E1 was used in addition to the doping agent. Accordingly, the skilled person starting from E1 with conductive compositions obtained with polystyrene sulfonic acid as doping agent would not be prompted to use a polyanion copolymer as defined in claim 2 of "auxiliary request 0". Accordingly, the subject-matter of the main request met the requirement of Article 56 EPC.

XV. The arguments of the respondent, as far as relevant for the present decision, can be summarized as follows:

Main request

(a) The subject-matter of claim 2 resulted from an arbitrary selection of features taken from the parent application. The parent application as filed did not disclose in particular that the m/n ratio should lie within the range of 0.2 to 1 for a polyanion based on polyalkylenes. Consequently, the subject-matter of claim 2 of the main request did not meet the requirements of Article 76(1) EPC.

"Auxiliary request 0"

(b) The allowability of amended claim 2 with regard to the requirements of Article 76(1) and 123(2) EPC was not contested. Novelty of the subject-matter of claim 2, in particular in view of example 10 of E1 was not contested either.

(c) Having regard to inventive step, the closest prior art was the disclosure of E1, in particular the conductive compositions obtained with polystyrene sulphonic acid as doping agent. It was not disputed that starting from those compositions, the problem solved by the subject-matter of claim 2 would be to provide further compositions allowing to achieve a compromise between stability, solvent solubility and content of residual ions. It was also not disputed that the skilled person seeking to solve that problem would not find any suggestion in the cited documents to modify the polyanion doping agent used in E1 to correspond to that now defined in operative claim 2.

XVI. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the main request filed with the statement of grounds of appeal, or alternatively on the basis of the claims of the auxiliary request labelled "auxiliary request 0" filed during the oral proceedings, or on the basis of the claims of one of the first to third auxiliary requests, filed with the statement of grounds of appeal, or on the basis of the claims of auxiliary request 3a filed with the letter of 6 January 2015, or on the basis of the claims of the fourth or fifth auxiliary request, filed with the statement of grounds of appeal, or on the basis of the claims of auxiliary request 5a filed with the letter of 6 January 2015.

XVII. The respondent (opponent) requested that the appeal be dismissed.

Reasons for the Decision

The appeal by the patent proprietor is admissible.

Main request

Admissibility - Extent of scrutiny

1. The subject-matter of the main request underlying the contested decision related to a conductive composition comprising a conjugated conductive polymer being at least one selected from the group consisting of polypyrroles and polythiophenes and also comprising a polyanion selected from a group consisting of various compounds. The subject-matter relating to

polythiophenes was found to lack novelty over E1, leading to the refusal of the main request. However the subject-matter relating to polypyrroles, which was made the subject-matter of the first auxiliary request, was found by the opposition division to meet the requirements of the EPC.

2. On appeal, the different subject-matters relating to polypyrroles and polythiophenes were no longer defined in a single claim 1, as was the case for the main request before the opposition division, but had been split up into two independent claims 1 and 2. Dependent claims 2 to 8 of the first auxiliary request before the opposition division have been retained in the main request under appeal and renumbered as claims 3 to 9 in view of the insertion of the new independent claim 2. The back reference to previous claims was also accordingly adapted.
- 2.1 Accordingly, the subject-matter of independent claim 1 of the main request on appeal taken alone or in combination with the features of claims 3 to 9 relates solely to embodiments using polypyrroles. This subject-matter corresponds to that according to claims 1 to 8 of the first auxiliary request on the basis of which the opposition division decided that the patent could be upheld in amended form.
- 2.2 Considering that the sole appeal to the decision of the opposition division has been filed by the patent proprietor, the Board, in application of the principle of prohibition of *reformatio in peius* (see decisions G 9/92 and G 4/93 (OJ EPO 1994, 875; confirmed in G 1/99, OJ EPO 2001, 381, point 4.1 and decisions T 856/92 (8 February 1995) and T 149/02 (25 July 2003)), has no power to consider the validity of claim 1 of the

main request when read alone or in combination with claims 3 to 9.

2.3 With the subject-matter of new independent claim 2 and claims 3 to 9, also referring back directly or indirectly to that claim 2, the patent proprietor seeks on appeal to defend subject-matter which relates to the use of polythiophenes. The admissibility of the present main request under Article 12(4) RPBA has not been contested by the respondent and the Board has no reason to take a different view.

3. The subject-matter of the present main request which is open to scrutiny by the Board is therefore that defined in its claim 2 when taken alone or in combination with claims 3 to 9.

Allowability of the amendments (Article 123(2) EPC and Article 76(1) EPC)

4. In accordance with the established case law of the boards of appeal of the EPO (see Case Law of the Boards of Appeal of the EPO, 7th edition 2013, II.F.1.2 and II.F.1.3), a patent based on a divisional application can only be amended if the amended patent meets both the requirements of Article 76(1) EPC and the requirements of Article 123(2) EPC. The relevant question to be decided in assessing whether the subject-matter of an amended claim extends beyond the content of the application as filed, is whether after the amendment the skilled person is presented with new technical information (see G 2/10 (OJ 2012, 376), point 4.5.1 of the Reasons and Case Law, supra, II.E.1). In other words, the above mentioned amendments are only allowable if the skilled person would derive the resulting claimed subject-matter directly and

unambiguously, using common general knowledge from both the parent and divisional applications as filed.

4.1 As a preliminary remark, the passages of the parent and divisional applications as filed are indicated for facilitating their identification in their versions as published, namely EP 1 634 922 A1 and EP 2 014 718 A1, the corresponding passages being found also in their respective versions as filed.

4.2 The parent application is directed to a total of seven inventions referred to as first to seventh "aspects". The subject-matter of the divisional application relates to the seventh aspect of the parent application. The relevant passages of the parent application are paragraphs [57] to [67], [387] to [437], [583] to [618] and [625], as well as claims 54 to 63.

4.3 The subject-matter of claim 2 of the main request has been indicated to be based on claim 54 of the parent application as filed. Compared to that claim 54, claim 2 of the main request contained *inter alia* the following amendments:

(1) the conjugated conductive polymer has been restricted to be at least one selected from the group consisting of polythiophenes,

(2) the polyanion has been restricted to be at least one selected from the group consisting of substituted or unsubstituted polyalkylene, substituted or unsubstituted polyalkenylene,

(3) the type of monomers having an anion group as constituent of the polyanion has been restricted to a specific group of monomers and

(4) the ratio of the number of monomers having an anion group m to that having no anion group n has been restricted to be within the range of $0.2 \leq m/n \leq 1$.

- 4.4 As to amendment (1) the parent application as filed undisputedly discloses the use of polythiophenes, although no preference between the conductive polymers envisaged, i.e. polypyrroles, polythiophenes and polyanilines, is indicated.
- 4.5 Concerning amendment (2), an explicit disclosure in the parent application as filed for combining polythiophenes and polyanions which are either polyalkylenes or polyalkenylenes was not provided. Paragraph [0396] of the parent application as filed suggests that the constituent units of the polymer constituting the polyanion is among the various types of polyanions disclosed in original claim 54, preferably a substituted or unsubstituted polyalkenylene, in view of the interaction between the conductive polymer and the unsaturated bonds in the polyalkenylene. This preference is reflected in claim 56 of the parent application which specifies that the polyanion, which comprises the constituent unit having an anion group and the constituent units having no anion group, is a polymer which includes a substituted or unsubstituted polyalkenylene as a constituent unit.
- 4.6 The parent application as filed, however, does not disclose that both polyalkylene and polyalkenylene polymeric chains bring about the same effect, which obviously does not necessarily take place for polyalkylene, as it is explained to be due to the presence of unsaturated bonds. Accordingly, in the light of the teaching of the parent application as

filed the skilled person would not consider those two polyanion types as equivalent.

4.7 Hence, amended claim 2 results in the skilled person being presented with new technical information, namely that specifically polythiophenes can be associated with a polyanion which is either a substituted or unsubstituted polyalkylene or a substituted or unsubstituted polyalkenylene.

4.8 The appellant's argument that both claims 1 and 2 should be considered as a unit for assessing whether the requirements of Article 76(1) or 123(2) EPC are met cannot convince, as the splitting up of original claim 54 into claims 1 and 2 is one of the amendments with respect to the parent application as filed. Accordingly, it has to be assessed whether that amendment also results in the skilled person being presented with new technical information.

4.9 Paragraph [0421] of the parent application merely repeats the information provided in claim 54 with respect to the type of conductive polymer, whereas paragraph [0388] of the parent application gives for each of the type of polyanions defined in claim 54 examples of repeating units. Those paragraphs, contrary to the appellant's opinion, cannot provide a basis for the combination of conductive polymer and polyanion as defined in amended claim 2.

4.10 Consequently, it is concluded that the subject-matter of amended claim 2 of the main request extends beyond the content of the parent application as filed, contrary to the requirements of Article 76(1) EPC. The main request is therefore not allowable.

Auxiliary request labelled "auxiliary request 0"

Admissibility of the new auxiliary request

5. The new auxiliary request was submitted during the oral proceedings after the Board had indicated that the definition of the polyanion being a substituted or unsubstituted polyalkylene as alternative to a substituted or unsubstituted polyalkenylene resulted in the subject-matter of claim 2 of the main request extending beyond the content of the parent application as filed. This auxiliary request differs from the main request solely in that said alternative that the polyanion is at least one selected from the group consisting of a substituted or unsubstituted polyalkylene has been deleted. Dependent claims 3 and 4 were adapted accordingly. Hence, this auxiliary request constitutes a direct and appropriate response to the Board's conclusion that claim 2 of the main request did not meet the requirements of Article 76(1) EPC. In addition, that amendment does not extend the scope or the framework of debate as set out by the statement of grounds of appeal and the reply of the opponent thereto. Hence, the board, using its discretion under Article 13(1) RPBA, admits the new auxiliary request into the proceedings.

6. In analogy to the reasons provided in above points 3 to 3.2 and following the adaptation of dependent claims 3 and 4 to new claim 2, the subject-matter of the auxiliary request which is open to scrutiny by the Board is that defined in its claim 2 when taken alone or in combination with claims 4 to 9.

Amendments

7. As indicated in above point 5.5 the parent application as filed discloses that any of the conductive polymers envisaged in claim 54 of the parent application, i.e. including polythiophenes, is preferably associated with a substituted or unsubstituted polyalkenylene. As to the additional amendments compared to claim 54 of the parent application as filed, resulting in present claim 2, those are identified as (3) and (4) in above point 5.3. As to amendment (3), the group of monomers defining the anion group as constituent of the polyanion is disclosed as such in paragraph [413] of the parent application. The definition of the monomers in the claim corresponds to the entire list of specific anion group containing monomers envisaged in the parent application as filed, which monomers - in line with the teaching of paragraph [399] - contain sulphonic acid group or monosubstituted sulphuric acid ester group in order to provide the necessary doping effect on the conjugated conductive polymer. Therefore, the list of anion monomers in the parent application will be read by the skilled person as being in combination with the above combination of polythiophenes and preferred type of chain for the polyanion. The preference for polyanions as now defined in amended claim 2 is furthermore illustrated by reference examples 1 to 4 of the parent application (paragraphs [587] to [595]).

8. Finally, concerning amendment (4) the ratio of the number of monomer of the polyanion having an anion group to the number of monomer of the polyanion having no anion group m/n is, according to paragraph [0405] (and claim 54) of the parent application as filed 1 or less, preferably less than 1 and more preferably from 0.2 to 0.7. According to the established case law (Case

Law, supra, II.E.1.7.1), in the case of disclosure of both a general and a preferred range of numerical values in the application documents as filed, a combination of the preferred disclosed narrower range and one of the part-ranges lying within the disclosed overall range on either side of the narrower range is unequivocally derivable from said documents. In the case under consideration, a minimum amount of anion groups of the polyanion is implicitly required, as those groups exert the doping effect on the conductive polymer (see paragraphs [398], [399] and [404]). Accordingly, the limitation of the ratio of the number of monomers having an anion group m to that having no anion group n to the range of $0.2 \leq m/n \leq 1$ represents a quantitative reduction of the range envisaged within the application as filed merely excluding ratios which are disclosed in the application as filed to be less preferred. This information relating to the ratio is generally valid, and is not limited to specific types of conductive polymer and polyanion chain. This amended numerical range for the ratio m/n is therefore disclosed in the parent application as filed in combination with the other features of amended claim 2.

9. Consequently, the subject-matter of present claim 2 is considered to be directly and unambiguously disclosed to the skilled reader of the parent application. It meets therefore the requirements of Article 76(1) EPC.
10. It was not disputed that the divisional application as filed contains passages which correspond to those of the parent application as filed that the Board found to provide a basis for the subject-matter of claim 2 of the auxiliary request. It is more specifically referred to claims 1 and 3, as well as paragraphs [0397], [399], [400], [405], [0406], [414] and [606] to [614] of the

divisional application as filed. Accordingly, claim 2 also meets the requirements of Article 123(2) EPC.

11. Regarding the dependent claims, it was not disputed that the additional features thereof do not result in an extension of the subject-matter beyond the content of the parent or the divisional application as filed. The Board has no reason to take a different view.
12. Consequently, the claims of the auxiliary request meet the requirements of both Article 76(1) and Article 123(2) EPC.

Novelty

13. The respondent did not contest novelty of the subject-matter defined in claim 2 of the auxiliary request which now requires the polyanion to be of the polyalkenylene type. The Board, at least in view of the requirement that the polyanion is at least one selected from the group consisting of substituted or unsubstituted polyalkenylene, is satisfied that E1 does not anticipate the subject-matter of claim 2 of the auxiliary request. The subject-matter of claim 2 and of claims 4 to 9 which refer to claim 2 for the definition of the conductive composition is therefore considered to meet the requirements of Article 54 EPC.

Inventive step

Closest prior art

14. Having regard to paragraphs [62], [63] and [389] of the specification, the object of the patent in suit (corresponding to the seventh aspect of the invention as described in the parent application) is to provide a

conductive composition containing a conjugated conductive polymer, which is soluble in organic solvents, has high conductivity, does not exhibit a large change in electrical conductivity due to temperature variation and also contains a small amount of residual ions. Those compositions can be employed for various purposes which require conductivity, for example antistatic agents (paragraph [645]).

- 14.1 E1 also relates to conductive compositions containing a conjugated conductive polymer. It discloses in claim 1 dispersions of polythiophenes comprising a polyanion, which compositions are used in the antistatic treatment of plastic mouldings (page 2, lines 1-2, page 3, lines 52-53 and page 5, lines 2-3). The compositions are obtained by polymerizing 3,4-dialkoxythiophene monomers in the presence of said polyanion (claim 5 and examples). According to page 3, lines 15-18 of E1 and reflected in its claims 3 and 4, the polyanion can be selected from polymeric sulphonic acids such as polystyrenesulphonic acids and polyvinylsulphonic acids. Other polymerizable monomers such as styrene can be used for their preparation (page 3, line 18). It is undisputed that this polyanion is implicitly disclosed in E1 (in particular at page 4, lines 28-30) to be used as a doping agent for the conductive polymer. Accordingly, the polyanion doping agent used in all examples of E1 for the preparation of the polythiophene composition is a polystyrenesulphonic acid, i.e. a polyanion having a ratio of the number of monomers having an anion group m to the number of monomers having no anion group n which is infinite, i.e. outside the range of 0.2 to 1 required by operative claim 2.

- 14.2 In example 10 of E1, 3,4-ethylenedioxythiophene is polymerised not only in the presence of polystyrene sulphonic acid as doping agent, but also in the presence of a polymer obtained by polymerising 47.5 wt.-% methyl methacrylate, 47.5 wt.-% of butadiene and 5 wt.-% of 2-acrylamido-2-methylpropanesulphonic acid, sodium salt. That polymer exhibits a ratio m/n of 0.016, i.e. below the lower limit of 0.2 defined in present claim 2. The parties concurred on this aspect. This specific polymer, although structurally falling within the terms of "polyanion" in the broadest sense, is not disclosed in E1 to act as a doping agent. The parties concurred that this polymer is implicitly disclosed in E1 to correspond to the component described at page 4, lines 49-53 of E1 as polymer latex or polymer dispersion having acidic groups (salts) such as $-\text{SO}_3^-$, $-\text{COO}^-$ or $-\text{PO}_3^{2-}$, which component is used if required to ensure sufficient stability of the dispersion.
- 14.3 Accordingly, having due regard to the technical content of E1, it would be unjustified to consider the embodiment disclosed in its Example 10 as the starting point for assessing inventive step, merely on the ground that it teaches the polymerisation of 3,4-ethylenedioxythiophene in the presence of a polyalkenylene based polyanion being a copolymer obtained by copolymerization of a monomer having an anion group and a monomer having no anion group. Starting from the copolymer disclosed in Example 10 as the embodiment of E1 coming to the closest to the subject-matter of operative claim 2 would purely be based on structural considerations and hindsight knowledge of the present invention, ignoring the proper technical teaching of that prior art document, according to which the polyanion doping agent used for

polymerising 3,4-ethylenedioxythiophene is preferably, as shown by all examples, polystyrenesulphonic acid. The copolymer used in Example 10 of E1 is, in contrast, never disclosed as being a polyanion doping agent.

- 14.4 Consequently, the disclosure of E1 which constitutes the closest prior art for assessing inventive step of the claimed subject-matter is represented by compositions obtained by the polymerisation of 3,4-ethylenedioxythiophene in the presence of polystyrene sulphonic acid as doping agent.

Problem and solution

15. Having regard to the disclosure of E1, the appellant submitted that the technical problem underlying the patent in suit was to provide polythiophene compositions having enhanced electrical conductivity and solubility. As solution to this problem the patent in suit proposes the compositions of claim 2 of the auxiliary request, which are characterized by a polyanion which is at least one selected from the group consisting of substituted or unsubstituted polyalkenylene, said polyanion being further characterized as being a copolymer obtained by copolymerization of a monomer having an anion group selected from the specific group defined in claim 2 and a monomer having no anion group, the ratio m/n of monomers having an anion group to monomers having no anion groups being further defined to lie within the range of $0.2 \leq m/n \leq 1$.

- 15.1 As to whether evidence has been provided that the claimed subject-matter provides a successful solution to the problem above-mentioned, the appellant referred to E17, whereas the respondent relied on E18.

- 15.2 E17 is an experimental report which aims at providing a comparison with example 10 of E1 and at demonstrating the beneficial effect of the polyanion according to operative claim 2 on the electrical conductivity and solubility of the polythiophene composition.
- 15.3 E17 provides with example 4 a repetition of example 10 of E1, whereas example 1, example 2 and comparative example 3 of E17 concern the polymerisation of 3,4-ethylenedioxythiophene in the presence of three copolymers obtained with various amounts of methyl methacrylate, butadiene and acrylamido-2-methylpropanesulphonic acid, sodium salts, but no homopolymer of styrene sulphonic acid. Accordingly, comparative example 3 of E17 which does not contain a polystyrene sulphonic acid, i.e. the doping agent used in E1 which is conventionally known in the art to have a dominant effect on electrical conductivity, cannot be considered to be representative of the teaching of E1, contrary to the opinion of the appellant.
- 15.4 As to the question whether examples 1 and 2 and comparative example 4 of E17 demonstrate the technical effects, allegedly obtained, the Board notes that the variations of the m/n ratio concerned in E17 are not made in comparison to the homopolymer of styrene sulphonic acid used in example 10 of E1, but to the copolymer of methyl methacrylate, butadiene and 2-acrylamido-2-methylpropanesulphonic acid, sodium salt. Hence, those tests have been carried out by varying the composition of the stabilising agent, instead of that of the doping agent (see also section 15.2, above regarding the function of the copolymer of example 10 of E1).

- 15.5 Hence, the experimental report E17 submitted by the appellant cannot demonstrate a causal link between the purported increase of electrical conductivity and solubility of the polythiophene composition and the features distinguishing the claimed compositions from those of the closest prior art.
- 15.6 According to the case law of the boards of appeal, alleged advantages to which the patent proprietor merely refers, without offering sufficient evidence to support the comparison with the closest prior art, cannot be taken into consideration in determining the problem underlying the invention and therefore in assessing inventive step (Case Law, supra, I.D.4.2). Since in the present case the alleged improvement lacks the required experimental support, the technical problem as defined in point 16 above needs reformulation.
- 15.7 According to paragraphs [406] and [407] of the specification the balance of the units of the polyanion as defined in operative claim 2, i.e. the ratio of constituent units having an anion group to the constituent units having no anion group, influences not only the doping effect on the conjugated conductive polymer, but also to a large extent the dissolution and dispersion properties of the conductive composition in solvents. This was not contested by the respondent who acknowledged that the solubility of such polyanions in polar solvents would depend on the proportion of hydrophilic and hydrophobic monomeric repeating units. In addition, the patent in suit indicates in the cited paragraphs that adjusting the ratio m/n to lie within the range defined in operative claim 2 results in a better distribution within the polyanion of the constituent units having an anion group, meaning a more

effective use of the polyanion for achieving the doping effect, thereby remarkably reducing excess of residual ions. This also has not been disputed by the respondent.

- 15.8 Thus, the Board is satisfied that the objective problem successfully solved over E1 is to provide conductive polythiophene compositions which provide a balance in terms of solubility in solvents, electrical conductivity and reduction of excess of residual ions.

Obviousness

16. It remains to be decided whether the proposed solution to the objective problem underlying the patent in suit is obvious in view of the state of the art.
- 16.1 As shown in above point 15.1 E1 merely suggests the use of doping agents being selected from polymeric sulphonic acids such as polystyrenesulphonic acids and polyvinylsulphonic acids and comonomers thereof, e.g. with styrene. E1 does not provide any indication that one could adjust the ratio of constituent units having an anion group and constituent units having no anion group of the doping agent in the manner defined in operative claim 2 in order to achieve a balance in terms of solubility in solvents, electrical conductivity and reduction of excess of residual ions.
- 16.2 As already indicated in point 15.2 above, E1 also describes at page 4, lines 49-53 polymer latices or polymer dispersions having acidic groups (salts) such as $-\text{SO}_3^-$, $-\text{COO}^-$ and $-\text{PO}_3^{2-}$, including the copolymer used in example 10 of E1. However, they are merely disclosed to be used for the purpose of ensuring sufficient stability of the dispersion, if required. There is in

particular no indication that they may be used for the purpose of doping the conjugated polymer, let alone that the ratio of constituent units having an anion group and constituent units having no anion group might be adjusted in order to influence dissolution and dispersion properties of the conductive composition in solvents.

16.3 Accordingly, E1 itself cannot lead in an obvious way to the subject-matter of operative claim 2.

16.4 The respondent did not refer to any document suggesting that an adjustment of the ratio of constituent units having an anion group and constituent units having no anion group of the doping agent would be useful in order to achieve a balance in terms of solubility in solvents, electrical conductivity and reduction of excess of residual ions when preparing conjugated conductive polymers.

17. For these reasons, the Board concludes that the subject-matter of claim 2, and by the same token that of dependent claims 4 to 9, involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

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 claims of auxiliary request 0 filed during the oral proceedings, and after any necessary consequential amendment of the description.

The Registrar:

The Chairman:



B. ter Heijden

M. C. Gordon

Decision electronically authenticated