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

Case Number: T 1336/06 - 3.4.03

Application Number: 97112098.5

Publication Number: 0820076

IPC: H01G 9/025

Language of the proceedings: EN

Title of invention:

Solid electrollyte capacitor and method for manufacturing the same

Patentee:

Nec Tokin Corporation

Opponent:

H.C. Starck GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 123(2)

Relevant legal provisions (EPC 1973):

EPC Art. 56

Keyword:

"Added subject-matter (no)"

"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1336/06 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 27 November 2009

Appellant: H.C. Starck GmbH
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
30 June 2006 concerning maintenance of European
patent No. 0820076 in amended form.

Composition of the Board:

Chairman: G. Eliasson
Members: E. Wolff
J. Van Moer

Summary of Facts and Submissions

I. The opponent appealed against the decision of the opposition division to maintain European patent 0820076 in amended form.

II. The following document, among others, was considered in the decision under appeal:

D1 = DE 42 43 091 A.

III. Together with the statement setting out the grounds of appeal, the appellant submitted a new document,

D15 = JP 02 238 613 A with English translation

for consideration in the appeal proceedings.

IV. At oral proceedings before the board, the appellant opponent requested that the patent be revoked. The respondent proprietor requested that the appeal be dismissed, or in the alternative, that the patent be maintained on the basis of one of auxiliary requests 1 to 3 filed with letter dated 12 March 2007 or auxiliary request 4 submitted during the oral proceedings. The respondent further requested that document D15 not be admitted into the proceedings.

V. The claims as maintained by the opposition division and forming the main request of the respondent read as follows:

"1. A solid electrolyte capacitor comprising a solid electrolyte layer formed of a polymeric

product layer of a polymerizable monomer, said polymeric product being doped with benzoquinone sulfonic acid.

2. A solid electrolyte capacitor comprising a solid electrolyte layer formed of a polymeric product layer of a polymerizable monomer, said polymeric product being doped with aromatic polysulfonic acid, wherein said polymeric product layer comprises at least one layer formed of a polymer of pyrrole, and an outermost layer formed of polythiophene derivative.

3. A solid electrolyte capacitor claimed in claim 2, wherein said polythiophene derivative is poly(3, 4-ethylenedioxy-thiophene)."

VI. The arguments presented by the appellant opponent can be summarised as follows.

(a) Claim 1 of the main request

The subject matter of the claim lacked an inventive step. The selection of benzoquinone sulfonic acid as dopant for a polymerizable monomer was obvious because document D1 disclosed that sulfonic acids have a large molecular size and that they are suitable doping agents for monomers such as thiophene and pyrrole. The compound benzoquinone sulfonic acid was itself known at the priority date.

(b) Claims 2 (and 3) of the Main Request

Article 123 (2) EPC

Claim 2 (and with it, claim 3) of the Main Request did not comply with the requirement of Article 123 (2) EPC. The wording of claim 2 encompassed solid electrolyte capacitors in which only one of the polymeric product layers was doped. The patent on the other hand only disclosed one example of a capacitor having two polymeric product layers, and in that example (Embodiment 6) both polymeric product layers were doped. Claim 2 therefore constituted an impermissible generalisation.

Inventive step

Document D15 newly submitted with the statement of the grounds of appeal should be admitted into the proceedings. It was submitted in reaction to the decision of the opposition division to maintain the patent with claims narrower than those originally granted. Document D15 was highly relevant in that it constituted the nearest prior art with respect to independent claim 2 of the main request.

Document D15 disclosed a solid electrolyte capacitor having a first layer made of polypyrrole and an outermost layer made of poly(3-methylthiophene). Document D1 disclosed the benefit of doping the electrolyte polymer with dopants having large molecules. The combination of

these disclosures rendered the subject matter of claim 2 obvious.

VII. The arguments presented by the respondent proprietor can be summarised as follows.

(a) Claim 1 of the main request

Inventive step

There were a nearly infinite number of organic acids having large volume molecules, and therefore, the selection of a specific compound could not be obvious without any indication towards the specific compound. As there was no hint at using benzoquinone sulfonic acid in D1, the subject-matter of claim 1 involved an inventive step.

(b) Claim 2 (and claim 3) of the main request

Article 123(2) EPC

Claim 2 was based on a combination of original claims 1 and 2 and there was no amendment to the wording relating to the doping of the polymeric product. Hence, the amendment complied with Article 123 (2) EPC.

Claim 2 was obtained by combining original claims 1 and 2 and further limiting the dopant to aromatic polysulfonic acid, the at least one layer of the polymeric product layer to a polymer of pyrrole and the outermost layer to a polythiophene derivative. This limitation was permissible since

the selection of the members of the groups as defined in original claims 1 and 2 was supported by Embodiment 6.

Inventive step

It was not obvious why new document D15, which is now central to the appellant's arguments on inventive step, had not been filed during opposition proceedings. It should not be admitted into the proceedings.

If document D15 were nevertheless to be admitted, it was noted that in document D15, layer formation was by way of electrolytic polymerization, which required a thin precursor layer of polypyrrole. Document D1 disclosed doping with organic acids of high volume in layers formed by way of chemical oxidation polymerization, as in the patent in suit. A skilled person would therefore not have combined documents D15 and D1.

Reasons for the decision

1. Admissibility

The appeal is admissible.

2. Amendment - Main request (claims as maintained)

2.1 Claim 1 differs from claim 1 as originally filed in that all alternatives to doping the polymerizable monomer with benzoquinone sulfonic acid have been

deleted. The permissibility of these amendments was never challenged by the appellant.

2.2 Claim 2 of the main request is a combination of the originally filed claims 1 and 2, with three extra limitations.

(a) The first limitation is that the organic sulfonic acid forming the dopant is specified to be an aromatic polysulfonic acid - rather than being an organic sulfonic acid selected from the group consisting of aromatic polysulfonic acid, organic sulfonic acid having hydroxy group, organic sulfonic acid having carboxyl loop, alicyclic sulfonic acid, and benzoquinone sulfonic acid.

(b) The second limitation is that the "at least one layer" is formed of a polymer of pyrrole - rather than of a polymer or copolymer of at least one monomer selected from the group consisting of pyrrole, thiophene, furan, aniline and their derivatives.

(c) Thirdly, the outermost layer is specified to be formed of polythiophene derivative - rather than being formed of polythiophene or polythiophene derivative.

2.3 It is common ground that Embodiment 6 represents the only example in the patent of a capacitor with a solid electrolyte consisting of more than one layer. Specifically, Embodiment 6 describes (with reference to step S3B of Figure 4) that a first conducting polymer layer was formed, which was composed of polypyrrole

doped with benzenedisulfonic acid. Thereafter, a layer of a poly(3, 4-ethylenedioxy-thiophene) doped with benzenedisulfonic acid was formed.

2.4 The appellant alleged that the new, restricted claim 2 presented the reader with a previously unspecified combination of features of the original claims 1 and 2 or, in the alternative, to be an impermissible intermediate generalisation of the features of Embodiment 6. At the core of the appellant's case is that claim ought to be interpreted as including structures in which only one of the two polymer layers was doped. Since in Embodiment 6 both layers were doped, Embodiment 6, the only example showing two layers, did not provide support for a claim with only one of the layers being doped.

2.5 It is undoubtedly true that, as argued by the appellant, claim 2 as originally filed, covered a multitude of possible combinations of organic sulfonic acids as dopants, monomers for the polymer (or co-polymer) of one layer and an outer layer of polythiophene or polythiophene derivative. Nevertheless, the board is not persuaded by the appellant's argument that claim 2 constitutes a selection that presents new information and thus contravenes Article 123(2) EPC, because claim 2 as originally filed also included the possibility of having only one of the two polymer layers doped. Hence, Embodiment 6 was from the outset the example that supported a subset of the claimed compounds corresponding to the selection to which the claim has now been limited.

2.6 Claim 3 corresponds to claim 3 as originally filed.

2.7 For the above reasons, the board finds that the claims as maintained by the opposition division comply with Article 123(2) EPC.

3. Admission of Document D15

3.1 Document D15 was submitted with the statement of the grounds of appeal. The appellant stated that the document was submitted in reaction to the decision of the opposition division to maintain the patent with claims narrower than those originally granted, and contended that this document was now the closest prior art to the invention as claimed in claim 2. It should therefore be admitted into the proceedings.

3.2 The respondent saw no obvious reason for the appellant submitting this late in the proceedings a document which appeared now to be central to the appellant's arguments on inventive step. It could and should have been filed during the opposition proceedings. The respondent therefore requested that that document D15 not be admitted into the proceedings before the board.

3.3 The board accepts that the claim 2 of the patent as maintained by the opposition division was significantly narrower in scope compared to the claim originally granted. The appellant's attempt to find and submit new prior art which he considered more relevant to this new claim 2 is therefore justified. The document is prima facie relevant to evaluating whether the claimed invention involves an inventive step. It also does not require unacceptably great efforts to understand the content of document D15. The board therefore admits

document D15 into the proceedings.

4. Novelty and Inventive step - Main request

Claim 1

- 4.1 It is common ground that for claim 1 document D1 is the closest prior art and that the claimed invention is new on account of the fact that benzoquinone sulfonic acid is not referred to as a suitable dopant in document D1.
- 4.2 Document D1 describes a process for making a solid electrolyte capacitor. The aim is to reduce the low ESR (electric series resistance) of the capacitor. The electrolyte is formed by oxidative chemical polymerisation of a monomer in the presence of a liquid salt of a sulfonic acid with at least 6 C-atoms (page 3 lines 41 to 45).
- 4.3 The appellant argued that that the specific choice of benzoquinone sulfonic acid as dopant was obvious in view of the disclosure in document D1. Benzoquinone sulfonic acid was a known compound at the priority date of the patent. It was a member of the group of sulfonic acids which are referred to in document D1 as suitable dopants. Even the beneficial aspects of choosing dopants with large molecular volume were discussed in document D1, which states that using molecules having relatively large volumes improves the long-term stability of the capacitors when operating at elevated temperatures, that is to say temperatures greater than 100°C (page 4, lines 14 to 23).

4.4 The board does not consider these arguments to be persuasive. While document D1 does indeed refer to large-volume dopants, and even to sulfonic acid compounds as dopants, there is no mention in document D1, or in any other document on file, of benzoquinone sulfonic acid as a dopant. Nor is there any indication anywhere that the specific choice of benzoquinone sulfonic acid might be a suitable or even a desirable dopant. Given the rather large number of possible candidates from which to choose the dopant, the board does not consider that benzoquinone sulfonic acid would have been an obvious choice for the skilled person.

4.5 For the above reasons, claim 1 as maintained by the opposition division and forming the respondent's main request involves an inventive step within the meaning of Article 56 EPC 1973.

Independent Claim 2

4.6 Document D15 discloses a solid electrolyte capacitor which has a first layer made of polypyrrole and an outermost layer made of poly(3-methylthiophene) (translation, pages 7 and 8: "Example 1"). The polypyrrole layer is formed by chemical oxidation polymerization. Using the polypyrrole layer as electrode, the polythiophene derivate layer is formed by electrolytic polymerization with tetraethyl ammonium fluoroborate (Example 1) or tetraethyl ammonium fluorophosphate (Examples 2 to 6) as supporting electrolyte. Numerous other compounds, including sulfonic anions (alkylbenzene sulfonic acid, nitrobenzene sulfonic acid, aminobenzene sulfonic acid, benzene sulfonic acid, β -naphthalene sulfonic acid),

are mentioned as suitable supporting electrolytes (translation, page 5, second paragraph).

- 4.7 Hence the capacitor of independent claim 2 differs from that of document D15 in that the polymeric product is doped with aromatic polysulfonic acid.
- 4.8 The above difference has the effect of increasing the temperature stability of the conducting polymer layer both in respect to high operating temperatures as well as high temperatures encountered during soldering of the device (patent, paragraphs 0011 to 0015). This effect attributed to large-sized dopants is also described in document D1 (page 4, lines 14 to 17).
- 4.9 While appearing at first sight relevant to evaluating the claimed invention, on closer inspection document D15 appears mostly to repeat in less specific terms information already known from document D1, such as the desire to keep the equivalent series resistance (ESR) low (D1, page 2, lines 19 to 22; D15 translation, page 2 line 21 to page 3, line 2), a conductive film made of polypyrrole (D1, e.g., page 4, lines 64 to 68; D15, page 5, lines 3 to 6) and the inclusion of sulfonic compounds into the conductive film (D1, page 4 lines 45 to 52; D15, page 5, lines 11 to 13).
- 4.10 Unlike in document D1, however, there is no emphasis in document D15 on the importance of selecting the dopants from a particular group of compounds and no hint whatsoever concerning the use of dopants having large molecular size. On the contrary, the Examples in document D15 are confined to the halogenated compounds (tetra)fluoroborate and (hexa)fluorophosphate as

dopants. Nor does document D15 refer in any way to the problem of temperature stability. Furthermore, it is also arguable whether the two-layer structure of document D15 is functionally a two-layer structure, because, as argued by the respondent, in document D15 the first layer is necessary only for forming the conductive polymer layer of thiophene derivative by electrolytic polymerisation. Hence, the electrical properties of the resultant product are determined by the second conductive polymer layer alone.

4.11 According to document D1, the polymer layer is formed by chemical oxidation polymerization, whereas in document D15 the main conductive polymer layer is formed by electrolytic polymerization. Thus, given that there is also a difference in the dopants used, the skilled person would not have combined documents D15 and D1, contrary to the assertion of the appellant.

4.12 Therefore, the subject matter of independent claim 2 as maintained by the opposition division and forming the respondent's main request involves an inventive step within the meaning of Article 56 EPC 1973.

5. For the reasons above, in the board's judgement, the patent as maintained by the opposition division meets the requirements of the EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

Registrar

Chair

S. Sánchez Chiquero

G. Eliasson