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Datasheet for the decision of 22 July 2022

Case Number: T 0371/20 - 3.3.09

Application Number: 14164701.6

Publication Number: 2792702

IPC: C08J7/12, C23C18/18, C23C18/16

Language of the proceedings: EN

Title of invention:
Chrome-free methods of etching organic polymers with mixed acid solutions

Patent Proprietor:
Rohm and Haas Electronic Materials LLC

Opponent:
HSO Herbert Schmidt GmbH & Co. KG

Headword:
Chrome-free methods of etching organic polymers/ROHM AND HAAS

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
Amendments - allowable (no)

Decisions cited:

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Beschwerdekammern

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Case Number: T 0371/20 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 22 July 2022

Appellant: (Patent Proprietor)	Rohm and Haas Electronic Materials LLC 455 Forest Street Marlborough, MA 01752 (US)
Representative:	Houghton, Mark Phillip Patent Outsourcing Limited 1 King Street Bakewell, Derbyshire DE45 1DZ (GB)
Appellant: (Opponent)	HSO Herbert Schmidt GmbH & Co. KG Schorberger Str. 18 42699 Solingen (DE)
Representative:	dompatent von Kreisler Selting Werner - Partnerschaft von Patent- und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 December 2019 concerning maintenance of the European Patent No. 2792702 in amended form.**

Composition of the Board:

Chairman	A. Haderlein
Members:	C. Meiners
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. This decision concerns the appeals filed by the patent proprietor and the opponent against the opposition division's interlocutory decision finding that the patent in suit ("the patent"), as amended in accordance with the third auxiliary request filed in the oral proceedings before the opposition division, met the requirements of the EPC. As both parties are appellants, they will continue to be referred to as the patent proprietor and the opponent.

II. In its notice of opposition, the opponent had requested that the patent be revoked in its entirety on, *inter alia*, the ground for opposition under Article 100(c) EPC.

III. In the decision under appeal, the opposition division found, *inter alia*, that the subject-matter of the then main request (patent as granted) extended beyond the content of the application as filed. However, the then third auxiliary request, on which the appealed decision is based, was found to meet the requirements of the EPC.

IV. With its statement setting out the grounds of appeal, the patent proprietor filed a main request and first and second auxiliary requests. The second auxiliary request corresponds to the then third auxiliary request held allowable by the opposition division. It also filed/re-submitted auxiliary requests 4 to 14 by reference (corresponding to auxiliary requests 1 to 11, filed with the reply to the notice of opposition on 27 July 2018 and renumbered as auxiliary requests 4 to

14 in the oral proceedings before the opposition division).

V. The board summoned the parties to oral proceedings and issued a communication under Article 15(1) RPBA 2020 in which it set out its preliminary opinion.

VI. Together with a letter dated 29 June 2022, the patent proprietor filed an alternative main request.

VII. Claim 1 of the patent application reads:

"1. A method comprising:
a. providing a substrate comprising one or more organic polymers;
b. providing an aqueous acid solution consisting essentially of sulfuric acid, one or more organic acids and Mn(II) ions and Mn(III) ions; and
c. contacting the one or more organic polymers of the substrate with the aqueous acid solution to etch the one or more organic polymers of the substrate."

VIII. Claim 1 of the main request of 29 June 2022 reads:

"1. A method comprising:
a. providing a substrate comprising one or more organic polymers;
b. providing an aqueous acid solution consisting essentially of sulfuric acid; one or more organic acids; one or more sources of Mn(II) ions; one or more sources of Mn(III) ions;
one or more oxidizing agents chosen from $KMnO_4$, MnO_2, persulfates, inorganic peroxides, organic peroxides, chlorites, chlorates, perchlorates, hypochlorites, osmiumtetroxide, silver(II)-oxide, ozone, cerium(IV) and lead acetate; water; and optionally one or more

catalysts are added to the solution if electrolysis is used wherein the one or more sources of Mn(II) ions and the one or more sources of Mn(III) ions are included in the aqueous acid solution at a concentration below their saturation concentrations; and
c. contacting the one or more organic polymers of the substrate with the aqueous acid solution to etch the one or more organic polymers of the substrate."

IX. At the oral proceedings before the board, the patent proprietor withdrew its main request filed with the statement setting out the grounds of appeal.

X. The patent proprietor's arguments relevant to the decision may be summarised as follows.

The interpretation of the "sources of" manganese ions put forward in the impugned decision was endorsed.

However, combinations of the use of one or more oxidising agents, electrolysis, and one or more sources of Mn(II) and Mn(III) salts were also supported in the original application, namely in the paragraph bridging pages 7 and 8. There was no legal basis that a "sole", i.e. single, disclosure was insufficient to support a feature combination.

A skilled person wishing to understand the term "sources" would find clear and direct guidance in the first and second paragraphs on page 6 of the description as filed. In these paragraphs, all the examples provided were of the respective Mn(II) or Mn(III) compounds.

Example 4 of the patent was a comparative example and did not undermine this interpretation of claim 1. Claim

1 distinguished between "oxidants" and "sources of Mn(II) and sources of Mn(III)". Consequently, potassium permanganate ($KMnO_4$) and manganese (IV) oxide (MnO_2) could not be taken as these "sources".

Likewise, the last paragraph on page 6 referred to Mn(III) species and did not provide guidance on Mn(II/III) "sources". Mn(0) or Mn(I) compounds were not described in the application as "sources", and Mn(IV) compounds or higher were excluded.

It followed that the substitution of the feature "and Mn(II) ions and Mn(III) ions" with the feature "one or more sources of Mn(II) ions; one or more sources of Mn(III) ions" in claim 1 of the main request on file was directly and unambiguously derivable from the application documents as originally filed.

Even when interpreting claim 1 more broadly by not limiting the sources of Mn(II) ions and Mn(III) ions to Mn(II) and Mn(III) salts, like the opponent did, the resulting feature combination was disclosed in the application as filed.

This conclusion applied to all the requests.

XI. The opponent's arguments relevant to the decision may be summarised as follows.

The subject-matter of all claim requests extended beyond the content of the application as filed and thus did not meet the requirements of Article 123(2) EPC. *Inter alia*, the restriction disclosed in original claim 1 and on page 4, line 16 as originally filed that the aqueous solution consisted, among others, essentially of Mn(II) and Mn(III) ions was missing from claim 1.

XII. Requests

The appellant-proprietor requests that the decision under appeal be set aside and that the patent be maintained on the basis of the main request filed with the letter of 29 June 2022, alternatively on the basis of the first, second or fourth to fourteenth auxiliary requests filed with the statement setting out the grounds of appeal (see above).

The appellant-opponent requests that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

1. Amendments (Article 123(2) EPC) - Main Request

1.1 The board observes that any amendment to a European patent application or a European patent is subject to the mandatory prohibition on extension laid down in Article 123(2) EPC and can therefore be made only within the limits of what the skilled person would derive directly and unambiguously, using common general knowledge, and seen objectively and relative to the date of filing, from the whole of the documents as filed (Case Law of the Boards of Appeal, 9th edn. 2019, Chapter II.E.1.3.1; also known as the "gold standard").

1.2 In this context, it has to be elucidated whether the substitution of the feature "and Mn(II) ions and Mn(III) ions" with the feature "one or more sources of Mn(II) ions; one or more sources of Mn(III) ions" in claim 1 gives rise to fresh subject-matter not

disclosed in the application as filed. Only full equivalence of the mentioned features would lead to the conclusion that the subject-matter of claim 1 is directly and unambiguously derivable from the application documents as filed. The board takes the view that a basis for the inserted expression can be found on page 6, lines 3 and 11 of the description as originally filed. However, as discussed in the oral proceedings, the corresponding indications "[t]hey are included in the solutions in amounts to provide the desired concentrations of Mn(III) ions in the solutions" and "[t]hey are included in the solutions in amounts to provide the desired Mn(II) ion concentration in the solutions" have not been inserted in claim 1 (page 6, lines 9 to 10 and 20 to 21). These limitations are missing from claim 1.

1.3 The board is of the view that claim 1 should be construed in the broadest technically sensible way. Such a claim construction does not rule out, for instance, Mn(II) or Mn(IV) compounds as "sources" of Mn(III) ions, in particular in the absence of the aforementioned limitations. The meaning of "sources" thus includes the conversion of the oxidation state of manganese ions by oxidation or reduction. This oxidation or reduction of a given manganese species can also be accomplished by electrolysis, as put forward by the opponent. Construing claim 1 in the broadest technically meaningful way would thus not exclude, for instance, Mn(IV) or Mn(VII) compounds as "sources" of Mn(II) or Mn(III) ions.

1.4 While, as set out in the impugned decision, such sources can be Mn(II) and Mn(III) salts, this is not stated in claim 1. Claim 1 leaves the nature of the sources of Mn(II) and Mn(III) ions open. As argued by

the opponent, any soluble manganese compounds of any oxidation state can be present in the aqueous solutions of claim 1 as "one or more sources of Mn(II) ions" and "one or more sources of Mn(III) ions", as long as they can be transformed into Mn(II) or Mn(III) ions, respectively. While the term "source" as used in claim 1 may be non-specific, it is thus not unclear.

1.5 Likewise, while claim 1 separately mentions "sources" of Mn(II/III) ions and compounds which should be taken as "oxidants" (such as $KMnO_4$), it does not rule out taking other manganese compounds having an oxidation state higher than (III) as "sources" of Mn(II) and/or Mn(III) ions. In contrast, a "narrow" interpretation of claim 1, excluding manganese compounds having oxidation states higher than (III) as "sources", would seem to be arbitrary and illogical and make no technical sense. As discussed during the oral proceedings before the board, Mn(III) compounds are also called "oxidizing agent" in line 7 on page 3 of the original description. While on page 1, line 23 (to which the patent proprietor referred) Mn(VII) is classed as an oxidising agent and not as a source, it has the same function, namely to oxidise/etch organic polymer surfaces. At the same time, the description of the application qualifies Mn(III) compounds not only as an "oxidizing agent" but also as a "source" of Mn(III) ions.

1.6 The board agrees with the opposition division's conclusion in the last paragraph on page 4 of its decision that a skilled person, when considering a claim, should rule out illogical interpretations or those which do not make technical sense. However, the broad interpretation of the term "sources" or "sources of" is technically sensible and not illogical. Consequently, construing the claim in a mind willing to

understand does not, in the current case, require that the broad term in question need be interpreted more narrowly in view of limitations not forming part of the claim wording. This wording should be interpreted using common general knowledge and seen objectively and relative to the date of filing (Case Law of the Boards of Appeal, 9th edn. 2019, Chapter II.A.6.1).

Therefore, the board does not apply the limited interpretation adopted by the opposition division which would imply equating the "sources" of Mn(II) or (III) ions with Mn(II) or Mn(III) compounds/salts.

1.7 The patent proprietor argued that the subject-matter of claim 1 was also directly and unambiguously derivable from the general disclosure of the description when interpreting claim 1 broadly regarding the meaning of the term "source" of Mn(II/III) ions. In this case, the broad interpretation of "source" would also be supported in the original description.

As put forward by the patent proprietor during the oral proceedings before the board, a "source" of Mn(II) or Mn(III) in an aqueous solution would be subject to an equilibrium. For instance, the patent proprietor correctly mentioned that Mn(IV) could be taken as a source of Mn(II) and that Mn(II) compounds were themselves sources of Mn(II) ions. Mn(0) could give rise to the formation of Mn(II), and Mn(II) could be obtained from Mn(III) ions during the etching process in which the polymer surface acted as a reducing agent for the Mn(III) ions. Mn(IV), Mn(VI) and Mn(VII) species were disclosed to yield Mn(III) on page 5 of the specification as filed. They could thus be considered "sources" if "sources" were construed broadly and not limited to Mn in the oxidation states

(II) or (III). According to the patent proprietor, Mn(V) and Mn(I) as oxidation states would not be considered by a skilled person.

However, the board does not endorse the patent proprietor's conclusion that these "sources" would necessarily result in the formation of Mn(II) and (III) ions under the conditions of an aqueous solution equilibrium and that they (Mn(II) and (III) ions) were inevitably present in the aqueous solutions since the compounds employed were sources and would thus inevitably yield Mn(II) or Mn(III) ions. Page 5 of the description as filed discloses various sources of Mn(III) ions which can form Mn(III) in the presence of Mn(II) ions. The proprietor argued that in the presence of a significant amount of Mn(II) ions, a significant amount of Mn(VII) ions could be converted into Mn(III) ions. On this point, the board reiterates that claim 1 does not require the presence of Mn(II) compounds or ions in the aqueous solutions of step b), let alone "significant" concentrations of them. It can thus not be argued that the presence of compounds/ions which have the *potential* to form Mn(II) or Mn(III) ions under suitable conditions can be equated with the *presence* of Mn(II) and Mn(III) ions in step b.

1.8 The board concludes that the substitution of the feature "and Mn(II) ions and Mn(III) ions" with the feature "one or more sources of Mn(II) ions; one or more sources of Mn(III) ions" in claim 1 gives rise to embodiments not disclosed in the application as filed. These are solutions not comprising Mn(II) and/or Mn(III) ions at all or solutions in which Mn(II) and Mn(III) ions are not the prevailing and thus majority fraction of manganese ions: original claim 1 stipulates that the solution *essentially consist* of the recited

components in step b. The substituted and substitute features are thus not equivalent. Therefore, the subject-matter of claim 1 lacks direct and unambiguous disclosure in the application as filed and does not meet the requirements of Article 123(2) EPC for this reason alone.

1.9 The patent proprietor referred also to the third paragraph on page 4 of the description as filed as support for claim 1. There it is mentioned, *inter alia*, that one or more sources of Mn(II) and Mn(III) ions may be included in the solutions to be prepared. The expression "[s]olutions essentially consist of Mn(II) ions and Mn(III) ions [...]" in this passage should not be interpreted too narrowly as a skilled person would realise that the solutions would also comprise the counter-ions to the Mn(II/III) ions and additional components. These ions would thus at best make up 50% of the weight and constitute a fairly small portion of the total mass.

1.10 The board, however, concludes that the sentence "[s]olutions consist essentially of Mn(II) ions and Mn(III) ions, sulfuric acid and one or more organic acids" in the third paragraph on page 4 cannot be rendered meaningless by arguing that Mn(II) and Mn(III) ions could be a "fairly small portion" of the solutions described in this passage. This sentence imposes, in the view of the board, a limitation absent in claim 1 in which Mn(II) and (III) ions can be present in very low amounts, relative to other oxidation states of manganese, or even be entirely absent. This means that Mn(II) and Mn(III) ions are not necessarily the prevailing and thus majority fraction of manganese ions in the aqueous solutions provided in step b of claim 1 (see point 1.8 above).

The subject-matter of claim 1 thus also fails to be directly and unambiguously derivable from the general disclosure of the original description.

1.11 It is for these reasons that the subject-matter of claim 1 does not meet the requirements of Article 123(2) EPC.

2. Auxiliary requests 1, 2 and 4 to 14

2.1 The patent proprietor did not produce additional arguments in favour of the allowability of auxiliary requests 1, 2 and 4 to 14 on file for the requirements of Article 123(2) EPC when asked by the board whether it would like to comment on this point. Moreover, no such additional arguments were provided in writing.

2.2 In the absence of such additional arguments, the board observes that the objections under Article 123(2) EPC raised in point 1 against claim 1 of the main request apply *mutatis mutandis* to the subject-matter of claim 1 of the auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

M. Schalow A. Haderlein

Decision electronically authenticated