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**Datasheet for the decision
of 20 September 2011**

Case Number: T 1198/07 - 3.3.07

Application Number: 01920697.8

Publication Number: 1268054

IPC: B01J 21/18

Language of the proceedings: EN

Title of invention:

Electrocatalyst powders, methods for producing powders and devices
fabricated from same

Applicants:

CABOT CORPORATION

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 123(2), 84, 54

Relevant legal provisions (EPC 1973):

-

Keyword:

"Amendments allowable - no added subject-matter"
"Clarity and support (yes)"
"Novelty (yes) - Remittal for outstanding issues"

Decisions cited:

-

Catchword:

-

Case Number: T 1198/07 - 3.3.07

**DECISION
of the Technical Board of Appeal 3.3.07
of 20 September 2011**

Appellant: CABOT CORPORATION
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted
20 February 2007 refusing European patent
application No. 01920697.8 pursuant to
Article 97(1) EPC.

Composition of the Board:

Chairman: J. Riolo
Members: F. Rousseau
D. Keeling

Summary of Facts and Submissions

- I. The appeal lies from the decision of the Examining Division posted on 20 February 2007 refusing European patent application No. 01920697.8, filed as international application No. PCT/US01/09367 on 22 March 2001 and published as WO 01/70392.
- II. The decision of the Examining Division was based on the sets of claims according to the then pending Main and 1st to 6th Auxiliary Requests, claim 1 according to the 4th Auxiliary Request reading as follows:
- "1. A method for the production of composite electrocatalyst particles, which comprise an active species phase dispersed on carbon, which method comprises the steps of:
- a) generating an aerosol of droplets from a precursor liquid wherein said precursor liquid comprises particulate carbon and at least a precursor to an active species phase;
 - b) moving said droplets in a carrier gas; and
 - c) heating said droplets so that liquid is removed from said droplets and said precursor is converted to said active species phase at a reaction temperature of not greater than 400°C, to form composite electrocatalyst particles having said active species phase dispersed on said carbon."

III. The following documents were cited during the examining procedure:

 - D1: US-A-4 482 641
 - D2: US-A-3 510 292
 - D3: WO 00/15547
 - D4: EP-A-0 696 473
 - D5: WO 99/42200
 - D6: Abstract of JP-A-02 009722 in Patent Abstracts of Japan, and
 - D7: Article by Takashi Ogihara *et al* in the Journal of the Ceramic Society of Japan, Int. Edition, 101 (1993), No. 10, pages 1128-1232.

IV. The Examining Division held *inter alia* that the subject-matter of claim 1 of the Main Request was anticipated by the disclosure of any of documents D1, D2, D4, D6 and D7. Referring to claim 1 and examples 1 and 5 of D2, the Examining Division held, that that document disclosed a spray-drying process wherein a slurry comprising carbon black and a metal compound was spray dried at a temperature below 400°C as implied by step (B) of claim 1 and example 1. The fact that the carbon particles comprising nickel or nickel oxides were not produced for the same purpose as in the application and in D2 was not relevant for the novelty of the claimed method. Hence, claim 1 of the Main Request

was not novel over D2. Moreover, the subject-matter of claim 1 according to any of the First to Sixth Auxiliary Requests also lacked novelty for the same reasons on the sole basis of prior art D2. In addition, as far as the Fourth Auxiliary Request was concerned, it met the requirements of Article 123(2) EPC, but not those of Article 84 EPC. The lack of compliance with the requirements of Article 84 EPC of claim 1 of the Fourth Auxiliary Request was justified firstly on the basis that there was no generally recognised definition of compounds to be considered as active species phase of an electrocatalyst. In addition, the definition of the precursor to the active species phase in terms of the result to be achieved was objected, as it was not clear which measures were needed for achieving conversion at a temperature not greater than 400°C. It was clear in this respect from the description as originally filed that it would not be possible to convert any "precursor to an active species phase" at a temperature not greater than 400°C. It was in particular not credible that the claimed method could be carried out at e.g. ambient temperature, which also was within the scope of the claim.

- V. In their notice of appeal dated 17 April 2007, the applicants (hereinafter referred to as the appellants) requested that the decision of the Examining Division be cancelled and the application be granted. With their statement setting out the grounds of appeal dated 28 June 2007, the Appellants submitted six sets of claims, as their Main and First to Fifth Auxiliary Requests. They also made a precautionary request for Oral Proceedings. The set of claims according to the new Main Request consisted of independent Claim 1 and eleven dependent claims, Claim 1 thereof corresponding to Claim 1 of the 4th Auxiliary Request underlying the contested decision, wherein in step b) the active species phase was defined with the Main Request to include a metal or a metal oxide. Claim 1 of the present Main Request read therefore as follows (the underlined passage indicates the feature added to claim 1 of the 4th Auxiliary Request underlying the impugned decision):

- "1. A method for the production of composite electrocatalyst particles which comprise an active species phase dispersed on carbon, which method comprises the steps of:
- a) generating an aerosol of droplets from a precursor liquid wherein said precursor liquid comprises particulate carbon and at least a precursor to an active species phase and wherein said active species phase includes a metal or a metal oxide;
 - b) moving said droplets in a carrier gas; and
 - c) heating said droplets so that liquid is removed from said droplets and said precursor is converted to said active species phase at a reaction temperature of not greater than 400°C, to form composite electrocatalyst particles having said active species phase dispersed on said carbon."

- VI. As concerned their Main Request, the Appellants argued that they had now specified that the active species included a metal or metal oxide in order to meet the Examining Division's objection that "there was no generally recognised definition of compounds to be considered as active species phase of an electrocatalyst". Support for this aspect of the invention could be found on page 12, lines 25-28 of the PCT publication. The Examining Division's objection to the feature that a reaction of not greater than 400°C was used, was not understood. The decision under appeal stated that it was "within the scope of the claim to conduct the reaction at e.g. ambient temperature". However, no further explanation was given on this point. That feature was clear and was disclosed in the application as filed. Moreover, it was linked to the requirement that conversion of the precursor to active species phase took place at the reaction temperature. As regards novelty, D2 related to a two-step process wherein in a first step the components were simply spray dried to dry the metal compounds without any conversion to a metal or metal oxide phase occurring. Conversion to a metal or metal oxide occurred then in a subsequent step at very high temperature. In contrast, in Claim 1 according to the Main Request the electrocatalyst particles were formed in one step, including conversion of the precursor compound to the metal or metal oxide active species, at temperatures of not greater than 400°C. Moreover, the present Main Request further distanced the claimed invention from D2, since D2 did not form a metal on the carbon during the spray-drying step. Novelty was therefore given. As a matter of precaution, arguments concerning the inventive merit of the claimed invention were given, should the further comments at the end of the contested decision be understood as a decision on inventive step.
- VII. In a communication dated 17 June 2011, the Board expressed the preliminary opinion that the amended claims according to the Main Request submitted on appeal fulfilled the requirements of Articles 123(2), 84 and 54 EPC. As the issue of inventive step had not been considered by the Examining Division on the basis of the present claims, the Board indicated that it was inclined to exercise its discretion under Article 111(1) EPC in favour of remittal of the case to the first instance for further prosecution, so that the Applicants would have the opportunity to have the issue of inventive step considered without loss of an instance.
- VIII. In reply to the Board's communication, the Appellants withdrew their request for oral proceedings on the understanding that the amended claims according to the Main Requests fulfilled the requirements of Articles 123(2), 84 and 54 EPC and asked in that event that the case be remitted to the first instance for dealing with the issue of inventive step.

Reasons for the Decision

Main Request

Amendments

1. Metal-carbon and metal oxide-carbon electrocatalyst particles including a metal or metal oxide dispersed on a carbon support are generally disclosed in page 13, lines 5-10 and lines 24-26 of the application as filed. The process for their production as defined in Claim 1 of the present Main Request finds a basis in claims 29, 32 and 36 of the application as filed, in conjunction with exemplified processes disclosed from page 72, line 5 to page 73, line 14 for metal oxide-carbon electrocatalyst particles and in page 104 for metal-carbon electrocatalyst particles, in line with the description of the method of production of the composite electrocatalysts from page 19, line 35 to page 20, line 16 and the disclosure that the preferred reaction temperature is not greater than 400°C disclosed on page 27, lines 3-19. The method according to Claim 1 of the Main Request is therefore based on the application as filed. The additional features specified in dependent Claims 2, 3, 4 to 6, 7 to 11 and 12 define preferred embodiments of Claim 1 that find, when not already disclosed in the above cited passages, at least a basis in original claims 30, 31, 33 to 35, 37 to 41 and page 31, lines 1-2, respectively. The Board is therefore satisfied that the claims according to the Main Request meet the requirements of Article 123(2) EPC.

Clarity

2. The limitation in present claim 1 that the precursor to an active species phase is converted to said active species phase at a reaction temperature of not greater than 400°C merely aims at excluding the use of precursors that are not converted at temperature below 400°C. Reading into the claims, as was done by the Examining Division, that the method must be workable at any temperature below 400°C, e.g. ambient temperature is imposing an additional requirement that is not even suggested in the application as filed. Claim 1 requires that conversion must take place, but does not define a minimum temperature for that reaction, as the skilled person is well aware that the conversion temperature of metal compounds serving as precursor for metal or metal oxide is a function of their structure and chemical constitution. The application as filed provides in the passage from page 34, line 25 to page 35, line 36, a teaching as to which precursors can be converted at a temperature of not greater than 400°C to metal or metal oxide. That teaching includes for specific metal complexes the use of reducing or oxidising agents, in line with present dependent claims 5 and 6, respectively. Hence, the definition of a precursor to an active species phase that includes a metal or a metal oxide, said precursor being

converted to said active species phase at a reaction temperature of not greater than 400°C is clear and supported by the description of the application as filed. Hence, contrary to the Examining Division's finding in the contested decision no objection under Article 84 EPC against present claim 1 arises from said feature. The claims according to the Main Request are therefore considered to meet the requirements of Article 84 EPC.

Novelty

3. The Claims according to the fourth Auxiliary Request underlying the contested decision were found by the Examining Division to lack novelty in view of D2. According to claim 1 and the corresponding passage in the specification (column 3, lines 17 to 25), D2 relates to a process for producing finely-divided metal / metal oxide compositions that comprises:

- in a first step providing a slurry comprising (1) carbon black and (2) a liquid medium bearing in solution form (a) a metal compound, the oxides of which can be converted to the corresponding free metal by reaction with carbon, and (b) a metal compound, the oxides of which cannot be reduced by carbon,
- in a second step spraying said slurry and conducting the obtained droplets through a zone heated to a temperature sufficient to evaporate the liquid medium, and finally
- heat treating the resulting particles under suitable conditions to convert said metal compound of (a) to the corresponding free metal and said metal compound of (b) to the corresponding metal oxide.

The passage at column 3, lines 17 to 25 discloses that the slurry is spray dried to produce extremely uniform dry particles comprising the starting ingredients and that said dry particles are heat treated under conditions suitable for converting the reducible metal compound to the corresponding free metal and the non-reducible metal compound to the corresponding metal oxide. It is also added in column 5, lines 16-19 that in the heat treatment step the temperature utilised to convert the metal compound forming part of the spray dried feedstock to the corresponding free metal and metal oxide can vary over a wide range. Therefore in the process according to D2 evaporation takes place without conversion of the metal compounds and conversion of the metal compounds that are present on the carbon particulates (i.e. the dried product obtained after evaporation) takes place in a subsequent separate step. On the contrary, the process according to Claim 1 of the Main Request defines a single step that leads to evaporation and conversion of the precursor to metal or metal oxide. Moreover, the conversion of the precursor to metal or metal oxide is carried out according to the presently claimed process at a temperature of not greater than 400°C, whereas D2 does not disclose temperatures in that range, but only conversion temperatures

of either 816°C (1500°F, examples 1 to 4) or 954°C (1750°F, example 5). Accordingly, novelty of the claimed subject-matter over D2 is given.

4. The other prior art documents cited by the Examining Division did not form any basis for a lack of novelty objection against patentability of the claims according to the then pending 4th Auxiliary Request. The Board on its own sees no reason to take a different view having regard to the present claims, which are even more restricted as they define in addition the nature of the active species phase that includes a metal or metal oxide. More particularly, D1 does not relate to a process employing carbon particulates, but carbon precursors that are co-crystallised in a first step with metal precursors. As to D3, although that document is concerned with a method of forming metal-carbon composite powders from an aerosol of precursors, it does not disclose conversion of the precursor to an active species phase that includes a metal or a metal oxide at temperatures of not greater than 400°C. Having regard to D4, that prior art document relates to a method of making an activated carbon supported catalyst, including carbonization of a carbon precursor in the presence of a metal precursor. It does not disclose spraying of a composition comprising a particulate carbon. With respect of D5, it discloses an aerosol method for providing powdered products, which method is not described to employ particulate carbon. D6 relates to the production of manganese oxide powder, which production includes spraying a solution containing a manganese compound. The solution sprayed also does not contain carbon particulates. Finally, D7 is concerned with the preparation of LiCoO_2 powders by the ultrasonic spray decomposition, but the solution sprayed does not contain carbon particulates either and the pyrolysis temperature is above 400°C. Consequently, the subject-matter claimed according to the Main Request is novel within the meaning of Articles 52(1) and 54 EPC over the disclosures of all documents presently in the proceedings.

Remittal

5. Having so decided on the allowability of the amendments under Article 123(2) EPC, the clarity of the claims under Article 84 EPC and the issue of novelty, the Board has not, however, taken a decision on the whole matter, since the essential issue of inventive step remains to be examined. While Article 111(1) EPC gives the Boards of Appeal the power to raise fresh issues in ex-parte proceedings where the application has been refused on other issues, proceedings before the Boards of Appeal in ex-parte cases are primarily concerned with examining the contested decision (see decision G 10/93, OJ EPO 1995, 172, points 4 and 5 of the reasons), fresh issues normally being left to the Examining Division to consider after a referral back, so that the Appellants have the opportunity for these to be considered without loss of an instance.

6. Under these circumstances the Board considers it appropriate to exercise the power conferred on it by Article 111(1) EPC to remit the case to the Examining Division for further prosecution on the basis of the claims according to the Main Request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution on the basis of claims 1 to 12 of the Main Request submitted with letter dated 28 June 2007.

The Registrar

The Chairman

S. Fabiani

J. Riolo