

**Internal distribution code:**

- (A) [ - ] Publication in OJ  
(B) [ - ] To Chairmen and Members  
(C) [ - ] To Chairmen  
(D) [ X ] No distribution

**Datasheet for the decision  
of 10 October 2013**

**Case Number:** T 0607/08 - 3.3.05  
**Application Number:** 00989532.7  
**Publication Number:** 1252093  
**IPC:** C01B25/37, C01B25/45, H01M4/58  
**Language of the proceedings:** EN  
**Title of invention:**  
PREPARATION OF LITHIUM-CONTAINING MATERIALS  
**Patent Proprietor:**  
VALENCE TECHNOLOGY, INC.  
**Opponent:**  
Clariant Produkte (Deutschland) GmbH  
**Headword:**

**Relevant legal provisions:**

EPC Art. 84, 123(2)  
RPBA Art. 13(1)

**Keyword:**

Main request and auxiliary request 1 - amendments not allowable  
Auxiliary request 2 - functional feature not allowable  
Auxiliary requests 3 to 6 - late filed - not clearly allowable

**Decisions cited:**

T 0068/85, T 0005/10, T 1634/10

**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 0607/08 - 3.3.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.05**  
**of 10 October 2013**

**Appellant 1:**  
(Patent Proprietor)

VALENCE TECHNOLOGY, INC.  
301 Conestoga Way  
Henderson, NV 89015 (US)

**Representative:**

Albrecht, Thomas  
Kraus & Weisert  
Patent- und Rechtsanwälte  
Thomas-Wimmer-Ring 15  
80539 München (DE)

**Appellant 2:**  
(Opponent)

Clariant Produkte (Deutschland) GmbH  
Brüningstrasse 50  
65929 Frankfurt am Main (DE)

**Representative:**

Stolmár, Matthias  
Stolmár Scheele & Partner  
Patentanwälte  
Blumenstrasse 17  
80331 München (DE)

**Decision under appeal:**

**Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
5 February 2008 concerning maintenance of the  
European Patent No. 1252093 in amended form.**

**Composition of the Board:**

**Chairman:** G. Rath  
**Members:** G. Glod  
P. Guntz

## **Summary of Facts and Submissions**

- I. This appeal lies from the interlocutory decision of the opposition division to maintain patent EP-B-1252093 in amended form on the basis of the fourth auxiliary request filed during oral proceedings before the opposition division.
- II. The patent proprietor (appellant 1) filed a notice of appeal on 27 April 2008 and submitted the statement setting out the grounds of appeal on 16 June 2008. He filed a new main and 2 auxiliary requests.
- III. The opponent (appellant 2) filed an appeal on 4 April 2008 and its statement setting out the grounds of appeal on 13 June 2008.
- IV. The patent proprietor filed observations in response to the opponent's statement of grounds of appeal on 17 November 2008.
- V. The opponent filed a response to the patent proprietor's statement of grounds of appeal on 26 November 2008.
- VI. The parties were summoned to oral proceedings for 10 October 2013 by letter of 10 April 2013. A non-binding preliminary opinion of the Board was attached, in which the Board indicated that claim 1 of the main and first auxiliary requests did not seem to fulfill the requirements of Article 123(2) EPC. In addition, the Board pointed out that a discussion was needed to determine from which part of the original application the product claims could be unambiguously derived. Furthermore, the Board noted that the functional features defining a technical result present in claim 1

of the second auxiliary request could not necessarily be considered clear within the meaning of Article 84 EPC.

- VII. The opponent filed further arguments with a letter of 6 September 2013.
- VIII. By letter of 1 October 2013, the patent proprietor filed a third and a fourth auxiliary request.
- IX. Oral proceedings took place on 10 October 2013. After having discussed Articles 123(2), (3) and 84 EPC of the main and auxiliary requests 1 to 4 as well as the late filing of auxiliary requests 3 and 4, the patent proprietor submitted auxiliary requests 5 and 6. Thereafter, the lateness and Articles 123(2), (3) and 84 EPC of these auxiliary requests 5 and 6 were discussed.
- X. The arguments of the **patent proprietor** relevant to the present decision can be summarized as follows:

The expression "a reducing agent comprising carbon" was to be construed as meaning that carbon was present as a reducing agent, but not necessarily the only reducing agent.

The application as originally filed contained numerous references to the use of carbon as a reducing agent without specifying that carbon was to be used in particle form. It was entirely clear from these passages that the carbon reducing agent need not necessarily be used in the form of particles. The particle form was rather a preferred embodiment of the reducing agent. In addition, it was implicit that

carbon itself was always in particle form.

It was clear from the original disclosure, in particular, at page 23, line 26 to page 24, line 3 that, in a preferred embodiment, the invention provided lithium mixed metal compounds containing a "transition metal".

The numerous references throughout the original application to a "lithium compound" or a "lithium-containing compound" without limitation with respect to the melting point clearly showed that the method of the invention could generally be carried out with lithium compounds and that the recitation of a "lithium compound having a melting point greater than 450 °C" in original claim 1 related only to a preferred embodiment of the invention. It was even stated on page 10, lines 21 to 24 that lithium hydroxide that has a melting point of about 400°C could also be used as a lithium compound.

It was clear from the application as filed that carbon was the reducing agent, so that it was unambiguous to the skilled person that the metal was reduced by carbon. Therefore, carbon had to be implicitly present in a sufficient amount. The non-oxidizing atmosphere was only a preferred option.

The application as filed had to be considered in its entirety when deciding whether claim 1 was unambiguously derivable therefrom.

It was true that the formulas of claims 32 to 34 of the main request were not disclosed as such in the original application, but it was unambiguously derivable for the skilled person that they represented preferred

embodiments of the general formula given in the description.

It was clear that the amount of carbon needed could be simply determined by the stoichiometry of the reaction as shown in the numerous examples. It was true that the reactions occurring were complex, but it was simple to establish whether a reduction really occurred by analyzing the obtained products. The skilled person should read the claims with a mind willing to understand and not read into the claim reactions that were not intended to be covered.

Formulating the claims in general terms should be allowed, since every feature could be verified by analysing the product that was finally obtained. It was unfair to force the patent proprietor to a claim relating to a single reaction.

Auxiliary requests 3 and 4 were filed in reaction to the late-filed document E21 and did not really change the case. The patent proprietor should be allowed to file further requests during oral proceedings, if these requests were obtained by deleting claims from requests already on file.

XI. The arguments of **the opponent** can be summarized as follows:

Main request:

The expression "comprising a reducing agent comprising carbon" was not unambiguously derivable from the original application, since carbon was disclosed as the sole reducing agent throughout the application, including the examples. There was no disclosure that other reducing agents could be present besides carbon.

In addition, it was not unambiguously derivable from the original application that carbon had not to be in particle form. According to original claim 1, the whole starting material had to be in particle form.

The expression "transition metal" was not disclosed *sui generis* in the original application, but only specified transition metal compounds.

In addition, it was not unambiguously derivable from the original application that lithium compounds not having a melting point higher than 450°C could be used.

The original application only disclosed heating in a non-oxidizing atmosphere and at a temperature sufficient to form a reduction product. The amount of carbon had to be such that it was sufficient to reduce the oxidation state of at least one metal. This was no longer part of claim 1.

Claims 32 to 46 referring back to claim 1 were consequently also not unambiguously derivable from the original application.

First auxiliary request:

Carbon was not disclosed as a reducing agent, but as the reducing agent in the original application. The objections not relating to carbon regarding claim 1 of the main request still applied to claim 1 of this request. Claims 32 to 46 were identical to claims 32 to 46 of the main request, so the objections raised in respect of these claims remained valid. The requirements of Article 123(2) EPC were therefore not fulfilled.



Second auxiliary request:

The combination of claims 29 to 35 with claims 1 to 28 was not originally disclosed, so claims 29 to 35 were not unambiguously derivable from the original application.

Claim 1 was formulated by the result to be achieved although it could not be recognized why such a formulation was necessary. The scope of the claim was unclear in view of the formulation "*amount sufficient to reduce the oxidation state of at least one metal ion of said starting materials without full reduction to an elemental state*". Furthermore, the skilled person did not know how the metal ion had to be reduced to fall within the scope of claim 1. It was also not clear whether active carbon really acted as a reducing agent or only had to be present in such amounts that it was able to react as a reducing agent.

In addition, different reactions might occur that led to the same products as indicated by the patent proprietor in its letter of 1 October 2013. Therefore, the determination of the product would not allow the skilled person to deduce whether a reduction with carbon really took place. The presence of several metal compounds in the starting material might render it impossible to deduce from the obtained products the reactions that occurred. The reactions occurring during the preparation of lithium mixed metal compounds were rather complex, as could be seen in the prior art and in the submissions made by the patent proprietor, so that it was not so easy to decide under which conditions a reduction really occurred.

Auxiliary requests 3 to 6 should not be admitted into the proceedings since they were filed late and did not overcome all the objections raised before.

XII. The wording of the independent claims to which reference is made in the present decision is given below.

Claim 1 of the **main request** reads as follows:

*"1. A method of making a lithium mixed metal compound from starting material comprising particles, wherein the particles comprise a lithium compound and a transition metal compound, characterized in that the starting material additionally comprises a reducing agent comprising carbon; the starting material is heated; and at least one metal in the starting material is reduced in oxidation state without full reduction to the elemental state during heating to form the lithium mixed metal compound."*

Claim 32 of the **main request** reads as follows:

*"32. A product comprising carbon and an active material of formula  $Li_xV_2O_5$  wherein  $x$  is greater than or equal to 0.2 and less than or equal to 2, made by a process of any of claims 1-5, 22, or 30, and the carbon is dispersed throughout the product."*

Claim 1 of the **first auxiliary request** contains the wording "comprises carbon as reducing agent" instead of "comprises a reducing agent comprising carbon" as present in claim 1 of the main request.

Claim 32 of **the first auxiliary request** is identical to

claim 32 of the main request.

Claim 1 of **the second auxiliary request** reads as follows:

*"1. A method of making a lithium mixed metal compound by reaction of starting materials which comprises: mixing starting materials in particle form, said starting materials comprising a metal compound, a lithium compound having a melting point greater than 450°C, and carbon, where said carbon is present in an amount sufficient to reduce the oxidation state of at least one metal ion of said starting materials without full reduction to an elemental state; and heating said starting materials in a non-oxidizing atmosphere at a temperature sufficient to form a reaction product comprising lithium and said reduced metal ion, wherein said metal compound is a compound of a metal selected from the group consisting of Fe, Co, Ni, Mn, Cu, V, Sn, Ti, Cr, and mixtures thereof."*

Claim 30 of **the second auxiliary request** is identical to claim 32 of the main request, except that it only refers back to claim 1.

Claim 1 of **the third auxiliary request** is further limited with respect to claim 1 of the second auxiliary request by the following wording *",and wherein said starting materials include a phosphate compound and said reaction product is a lithium metal phosphate."*

Claim 27 of **the third auxiliary request** is identical to claim 30 of the second auxiliary request.

Claim 1 of **the fourth auxiliary request** reads as follows:

"1. A method of preparing a lithium mixed metal compound of the general formula  $Li_aMI_bMII_c(PO_4)_d$  where  $0 < a \leq 3$ ; the sum of  $b$  plus  $c$  is greater than zero and up to 2;  $0 < d \leq 3$ ;  $MI$  is selected from Fe, Co, Ni, Mn, Cu, V, Ti, Cr, and mixtures thereof;  $MII$  is a metal or semi-metal having a +2 oxidation state, and is selected from Groups 2, 12 and 14 of the Periodic Table; wherein

the method comprises providing starting materials in particle form; the starting materials include a lithium compound, one or more metal compounds, a phosphate compound, and carbon; the lithium compound, one or more metal compounds, and phosphate compound are included in a proportion which provides the stated general formula; the starting materials are mixed together with carbon, which is included in an amount sufficient to reduce the metal ion of one or more of the metal-containing starting materials without full reduction to the elemental metal state; the starting materials are then reacted together where the reaction is initiated by heat, whereby the lithium, metal from the metal compound(s), and phosphate combine to form the  $Li_aMI_bMII_c(PO_4)_d$  product; and an excess quantity of carbon is used and an amount of carbon remains after the reaction and is very intimately mixed with the product."

Claim 1 of **the fifth auxiliary request** is identical to claim 1 of the main request.

Claim 1 of **the sixth auxiliary request** is identical to claim 1 of the third auxiliary request.

XIII. Requests:

The patent proprietor requests that the impugned decision be set aside and that the patent be maintained on the basis of the main request, or alternatively on the basis of one of the auxiliary requests 1 and 2 filed with the statement of appeal or of one of the auxiliary requests 3 and 4 filed with the letter of 1 October 2013 or of one of the auxiliary requests 5 and 6 filed during the oral proceedings on 10 October 2013.

The opponent requests that the the decision of the opposition division be set aside and that the patent be revoked.

**Reasons for the Decision**

Main request

1. Article 123(2) EPC
- 1.1 Claim 1 is directed to a method of making a lithium mixed metal compound. It differs from claim 1 of the application as originally filed in several features:
  - a) the starting material comprises particles, but does not have to be in particle form,
  - b) the particles comprise a transition metal compound,
  - c) the starting material comprises a reducing agent comprising carbon that is not necessarily in particle form,
  - d) the lithium compound does not have to have a melting point greater than 450°C,

- e) the carbon does not have to be present in an amount sufficient for reducing the oxidation state of at least one metal and,
- f) the heating is not done in a non-oxidizing atmosphere.

1.2 It needs to be decided whether these amendments are unambiguously derivable from the original application.

Claim 1 of the present request relates to a lithium mixed metal compound in general. The only passage in the original application that relates to a process for the preparation of lithium mixed metal compounds in general is on page 4, lines 8 to 10, where it is indicated that methods for making lithium mixed metal materials are also provided. Such a method is provided in claim 1 of the original application. Starting from page 4, line 18, the description as originally filed deals with one specific aspect, namely lithium mixed metal **phosphates**. Pages 5 to 8 all relate to lithium mixed metal **phosphate** compounds. In the paragraph bridging pages 7 and 8 (page 7, line 22 to page 8, line 28) it is described how the lithium mixed metal **phosphate** can be prepared. There is no indication in that passage or anywhere else in the original description that the method described there applies to all lithium mixed metal compounds.

Therefore, it is not unambiguously derivable that the process disclosed there can be generalized to all lithium mixed metal compounds.

The Board will analyse all the features one by one.

Feature a)

On page 7, lines 28 to 29 of the original application

it is disclosed that the starting materials are provided in particle form. However, on page 8, lines 1 to 6 it is indicated that the specific starting compounds (lithium-containing compound, phosphate containing anion) are *preferably* in particle form. These two passages are ambiguous with respect to the form in which the starting materials have to be provided for the preparation of lithium mixed metal **phosphates**, so even for these specific lithium mixed metal compounds the skilled person cannot unambiguously deduce that the starting materials do not have to be in particle form.

On page 10, line 30 it is indicated that the precursor compounds are generally in particle form, but again this passage is in the context of lithium mixed metal **phosphates** as the sentence starting in line 31 refers to phosphate salts. Therefore, the skilled person cannot deduce from that passage that particles are only a preferred option in a method for preparing lithium mixed metal compounds in general.

Feature b)

After the brief discussion of the drawings (pages 17 to 22), a detailed description of the preferred embodiments is given on page 23 onwards. The first sentence on page 23 makes clear that what follows concerns lithium mixed metal **phosphates**. The expression "transition metal" is disclosed only once in the original application in the context of starting materials, i.e. on page 24, line 1, and once in original claim 17. However, none of these passages provides an unambiguous disclosure of feature b). As already indicated, the expression on page 24 relates to the lithium mixed metal **phosphates**. Furthermore the transition metal indicated on page 24 is limited to

"*selected from said group*" and the group is given on page 23, lines 31 to 32. Consequently, there is no general disclosure that any transition metal can be used in the preparation of lithium mixed metal compounds in general.

Claim 17 of the original disclosure relates to oxides of a transition metal and refers back to method claim 13. Original claim 13 relates to a method of making a lithium mixed metal compound and includes a compound containing a polyanion capable of forming a crystal lattice in the starting materials. Therefore, the skilled person would also not recognize from the disclosure in original claim 17 that any transition metal compound can be used in the preparation of lithium mixed metal compounds in general.

Feature c)

The process described in the paragraph bridging pages 7 and 8 is conducted with carbon as reducing agent, and no mention is made of a reducing agent comprising carbon. The next paragraph still relating to the production of lithium mixed metal **phosphates** (page 8, line 29 to page 9, line 19) discloses that binders can be used (see page 9, lines 6 to 7). In a preferred aspect binders comprising carbon could be used that would decompose and form a carbon residue before the start of the reaction. There is no explicit disclosure that this carbon residue acts as a reducing agent. The skilled person would understand that this carbon residue obtained "in situ" can possibly act as a reducing agent (under certain conditions). This passage does not teach that a reductant other than carbon itself acts as reductant in the preparation of lithium mixed metal **phosphates**. It cannot be derived therefrom that any reducing agent comprising carbon could be used



in a method of making lithium mixed metal **phosphates**, let alone lithium mixed metal compounds in general. There is no other passage in the description disclosing that besides carbon a different reductant could be used.

Page 13 discusses the oxidation reaction of carbon and even explicitly refers to the reductant carbon (lines 22 and 23), which unambiguously points towards carbon as the only reductant.

Feature d)

The paragraph starting on page 9, line 20 seems to relate again to lithium mixed metal **phosphates**, since reference is made to the "*stated general formula of the product*" and the only formula of a lithium mixed metal compound given previously is the one of lithium mixed metal **phosphates**. In this paragraph ending at page 10, line 27 the type of lithium compounds to be used is discussed. The Board understands therefrom that lithium compounds having a high melting point are preferred since they react with the other precursors before melting. However, lithium hydroxide that has a melting point of about 400°C can also be used, but only with some precursors, particularly the phosphates (see page 10, lines 23 to 25), since it reacts with those precursors prior to melting. It is not unambiguously derivable that any type of lithium compound can be used with any type of precursor in a method of making a lithium mixed metal compound in general.

The paragraph on page 12, lines 17 to 30 seems to discuss the reaction temperatures in general. The first part indicates that it is desirable to conduct the reaction at a temperature where the lithium compound reacts before melting and that the temperature should

be about 400°C or greater. The second part discusses the temperatures with respect to the oxidation of carbon, and a suitable range for many reactions is given as 700 to 950°C. The skilled person would understand this passage to mean that it is most desirable to have lithium compounds having a high melting point, since then the reaction occurs before melting of the lithium and the oxidation of carbon is in a preferred range.

Therefore, the Board does not share the view that it can be unambiguously derived from this passage that any type of lithium compound, as currently claimed, can be used.

Feature e)

According to claim 1 the reduction of one metal in the starting materials does not have to be done by carbon. Carbon needs to be present only as part of a reducing agent, but it is not indicated that the carbon reduces one metal in the starting materials. The Board is of the opinion that this is not unambiguously derivable from the original application, since carbon is given as the only reductant therein. On page 8, lines 9 to 13, relating to the preparation of lithium mixed metal phosphates, it is disclosed that the starting materials are mixed together with carbon, which is included in an amount sufficient to reduce the metal ion of one or more of the metal-containing starting materials without full reduction to an elemental metal state. Although it is not exactly clear what this amount should be (see also below), it seems unambiguous that carbon is the only reductant responsible for the reduction of the metal ion. This is completely in line with the rest of the description (see page 13, lines 12 to 32; page 26,

lines 7 to 15; page 60, lines 9 to 10) and all the examples.

Therefore, the Board concludes that feature e) is not unambiguously derivable from the original application.

Feature f)

Page 14, line 21 to page 15, line 5 does not relate to a specific lithium mixed metal compound, but discusses in general the heating of the starting materials. It is disclosed that the heating is preferably conducted under non-oxidizing or inert gas (see page 14, lines 26 and 27). The Board is of the opinion that the skilled person would recognize therefrom that any atmosphere can be used as long as the carbon is successful in reducing a metal ion of the starting material.

Feature f) is therefore considered unambiguously derivable from the original application.

- 1.2.1 Pages 14 and 15 do not provide any passage from which one of features a) to e) could be unambiguously derived.

The Board is of the opinion that pages 23 to 26, line 15 relate to lithium mixed metal **phosphates** and no teaching is given that what is disclosed there applies to all lithium mixed metal compounds. There is no passage in the application as originally filed that would allow the skilled person to conclude that everything that is disclosed for lithium mixed metal **phosphates** applies to all lithium mixed metal compounds.

Examples I-VIII and X relate to specific lithium mixed metal **phosphates** and example IX discloses the formation

of gamma-LiV<sub>2</sub>O<sub>5</sub>. Features a) to e) present in claim 1 cannot be derived therefrom.

Therefore, the Board concludes that features a) to e) are not unambiguously derivable from the original application for a method of making a lithium mixed metal compound.

1.2.2 To conclude, claim 1 is not unambiguously derivable from the original application.

1.3 Claim 32 relates to a product comprising carbon and an active material of formula Li<sub>x</sub>V<sub>2</sub>O<sub>5</sub>. Such a material was not originally claimed, so it needs to be decided whether it is unambiguously derivable from the original application.

The original application only discloses gamma-LiV<sub>2</sub>O<sub>5</sub> at page 12, line 13 and in example IX, and the Board cannot find any disclosure that would allow a generalization of this specific compound to Li<sub>x</sub>V<sub>2</sub>O<sub>5</sub>. The Board is at a complete loss when trying to find a basis for the feature "*x is greater than 0.2 and less than or equal to 2*". In the original application x is disclosed only in the context of lithium mixed metal **phosphates**, but the general formula Li<sub>x</sub>V<sub>2</sub>O<sub>5</sub> cannot be deduced therefrom.

Claim 32 is not unambiguously derivable from the original application.

1.4 Since at least the subject-matter of claims 1 and 32 does not fulfill the requirements of Article 123(2) EPC, the main request must fail.

First auxiliary request

2. Article 123(2) EPC

2.1 Features a), b), d) and f) remain as indicated in point 1.1 above. The same applies to feature e, since the change in feature c) still does not imply that the metal in the starting materials is only reduced by carbon. Other reductants can be present and it is not part of claim 1 that the reduction is only achieved by carbon.

The arguments raised for features a), b) and d) to f) for claim 1 of the main request remain valid for claim 1 of this request, so the said claim also is not unambiguously derivable from the original application.

2.2 Claim 32 of this request is identical to claim 32 of the main request, so the arguments raised for the main request still apply here.

2.3 Since at least the subject-matter of claims 1 and 32 does not fulfill the requirements of Article 123(2) EPC, the first auxiliary request must fail.

Second auxiliary request

3. Article 84 EPC

3.1 Claim 1 relates to a method of making a lithium mixed metal compound, wherein a reaction product comprising lithium and a reduced metal ion should be formed. This formulation implies that several reaction products are possibly formed. Claim 1 is also defined by a functional definition that indicates the result that should be achieved, namely "*in an amount sufficient to reduce the oxidation state of at least one metal ion of*

*said starting materials without full reduction to an elemental state".*

3.2 According to the established case law based on T 68/85, functional features defining a technical result are permissible in a claim

(i) if such features cannot otherwise be defined more precisely without restricting the scope of the invention, and

(ii) if the scope of the claim can be directly and positively verified by tests or procedures adequately specified in the description or known to the person skilled in the art and which do not require undue experimentation.

3.3 It needs to be determined whether conditions (i) and (ii) are fulfilled.

3.3.1 Condition (i)

In the process according to claim 1, carbon acts as a reductant of a metal compound. According to the description, at least a stoichiometric amount of carbon should be present in the process (see page 9, line 25 to 27). This is also confirmed by examples I to X, wherein calculation of the amount of carbon to be used is always based on the stoichiometry of the reaction. The stoichiometric amount is dependent on the oxidation reaction of carbon (see page 12, line 31 to page 13, line 2). This relationship between carbon and atomic unit of metal to be reduced is explained on page 14, lines 9 to 20.

The Board is of the opinion that the amount of carbon to be used as a reductant could have been defined more precisely if based on stoichiometric considerations

without restricting the scope of the invention. Such a formulation based on stoichiometry would at least have allowed a clear definition of the minimum amount of carbon needed.

Therefore, for the Board, condition (i) mentioned above is not fulfilled.

### 3.3.2 Condition (ii)

According to claim 1 the amount of carbon should be sufficient to reduce at least one metal ion of the starting materials, but it should not lead to a full reduction to an elemental state.

The reaction conditions (e.g. temperature, pressure, time) under which the amount of carbon is sufficient have not been defined. It is very clear from the description that the amount of carbon needed is dependent on the reaction conditions (see page 13, lines 29 to 32; page 26, lines 10 to 15 and page 58, lines 13 to 23). This is also in line with the arguments raised by the patent proprietor in its letter of 17 November 2008, wherein it is stated that the reactions involved complex kinetics and thermodynamics.

In addition, the functional formulation is awkward, since it does not explain how much of the metal compound present in the starting materials should be reduced. It is also not clear how much of the reaction product comprising lithium and the reduced metal ion should be obtained. In fact, the formulation "a reaction product" means that several reaction products can be obtained, but it is not specified how much of the indicated reaction product is desired.

The skilled person knows that the amount needed depends on the oxidation reaction of the carbon. As explained in the description, less carbon is needed when carbon dioxide instead of carbon monoxide is produced (see page 14, lines 6 to 20).

Depending on the reaction conditions chosen, especially the temperature, the same amount of carbon present could in one case be considered sufficient while in a different case not sufficient.

As indicated in 3.3.1, it appears from the description that at least a stoichiometric amount of carbon should be present, but the current definition does not reflect this meaning.

The main problem with the functional definition of the amount of carbon present in claim 1 is that the skilled person does not know when he is inside or outside the scope of the claim.

Working with an amount of active carbon that is theoretically able to reduce the metal ion does not necessarily mean that a reduction takes place, since this depends on the temperature and time of the reaction.

D6 discloses  $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$  that can be obtained by reacting a lithium compound in combination with a ferric iron compound and a phosphate compound (see column 8, line 12 and lines 28 to 67 and column 9, lines 1 to 38). Starting from these starting materials and additionally carbon,  $\text{LiFePO}_4$  can be obtained under certain reaction conditions. However, under different reaction conditions combinations of several reaction



products such as  $\text{LiFePO}_4$  and  $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$  can be obtained. The skilled person does not know whether the presence of small amounts of  $\text{LiFePO}_4$ , which is a product comprising lithium and a reduced metal ion, is already considered as a product that should be obtained in claim 1 or whether at least a high percentage such as 80% or 90% is needed. Consequently, the skilled person would not know whether the amount of carbon was sufficient for reducing enough of one metal ion. It is true that the reaction product can be analysed for example by X-ray diffraction, but it is not defined how much of the product should be considered as the desired product. In all the examples only a single product was obtained without the presence of impurities such as  $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$  or precursor materials. Claim 1, however, is not limited to a single reaction product. The skilled person does not learn from the examples how much of the product mixture should be composed of lithium and the reduced metal ion to be considered a reaction product. Therefore the determination of the product mixture also does not allow the skilled person to determine whether or not the amount of carbon initially present was sufficient.

It would appear that the reduction of only small amounts of the metal compound present in the starting materials was not considered as desirable, since the patent proprietor indicated in its letter of 1 October 2013 that carbon can be considered as a reductant only if significant amounts were reduced. This is not reflected in the current wording of claim 1, where it is left to the skilled person to speculate when the amount of carbon can be considered sufficient or not.

Furthermore, it is also not defined how the expression

"without full reduction to an elemental state" is to be understood, since the skilled person would not know whether small amounts of fully reduced metals would still be acceptable.

As stated above, the reaction conditions under which it should be determined whether or not the amount of carbon is sufficient are not given. Determination via the reaction product is also not possible since, as explained above, the skilled person does not know what amount of the desired product should be part of the reaction products. There is another indication showing that it is not possible to deduce from the analysis of the reaction products whether a reduction reaction occurred. As indicated by the patent proprietor in its letter of 1 October 2013, the reduction of a metal compound such as manganese(IV) oxide to manganese(III) can occur spontaneously under certain reaction conditions. This means that finding a product comprising reduced manganese does not imply that manganese was inevitably reduced by carbon. Consequently, in such a case, it is also not possible to know whether or not the carbon was sufficient to reduce the metal.

3.3.3 The Board concludes that condition ii) is also not fulfilled, since no clear tests are given which make it possible to determine whether or not the amount of carbon is sufficient. Analysis of the reaction product(s) alone does not always make it possible to conclude that carbon has indeed reduced the oxidation state of the metal.

3.3.4 Since neither of conditions i) and ii) is fulfilled, the functional definition present in claim 1 cannot be

accepted and claim 1 does not fulfill the requirements of Article 84 EPC.

4. Article 123(2) EPC

Claim 30 of this request is identical to claim 32 of the main request, so the objections made in respect of claim 32 of the main request are also valid here. At least claim 30 does not fulfill the requirements of Article 123(2) EPC.

5. Since claim 1 does not fulfill the requirements of Article 84 EPC and claim 30 does not fulfill the requirements of Article 123(2) EPC, the second auxiliary request must fail.

Auxiliary requests 3 to 6

6. Article 13(1) RPBA: Admissibility of requests

- 6.1 Under Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA), it is at the Board's discretion to admit any amendment to a party's case after it has filed its grounds of appeal or reply. When exercising such discretion, the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy should be considered.

- 6.2 Since auxiliary requests 3 to 6 were filed after oral proceedings had been arranged, they constitute amendments to the party's case in the sense of Article 13(1) RPBA.

According to an approach frequently adopted by the boards (see e.g. T 1634/10 and T 5/10), such a request

may be admitted and considered at the board's discretion

- i) if sound reasons exist for filing this request so far into the proceedings (this may be the case when amendments are occasioned by developments during the proceedings),
- ii) if the auxiliary request does not extend the scope of discussion,
- iii) if the auxiliary request is clearly or obviously allowable.

6.3 In the present case, the patent proprietor submitted auxiliary requests 3 and 4 with the letter of 1 October 2013, which means 10 days before oral proceedings. Auxiliary requests 5 and 6 were filed during oral proceedings.

6.3.1 It is not apparent to the Board why these requests were filed so late, especially since the objections under Article 123(2) EPC and Article 84 EPC were already set out in the communication of 10 April 2013 sent under Article 15(1) RPBA. The letter of the opponent of 6 September 2013 did not contain any new arguments that could be qualified as having led to a new development of the proceedings. Nor did the discussion during oral proceedings lead to new developments. The Board cannot recognize any sound reasons for such late filing of the requests.

6.3.2 Auxiliary requests 3 to 6 do not really extend the scope of discussion, since they still contain deficiencies already indicated in the communication of 10 April 2013 sent under Article 15(1) RPBA.

6.3.3 It is doubtful that auxiliary requests 3 to 6 really can be considered as an attempt to overcome already known objections.

In particular, auxiliary request 3 still contains the functional definition of the amount of carbon in claim 1 and product claims such as claim 27. It is true that claim 1 has been amended by further defining "a *reaction product*" as lithium metal phosphate. However, this does not overcome the objections raised in respect of claim 1 of the second auxiliary request under Article 84 EPC (see point 3 above).

Auxiliary request 4 also contains the functional definition of the amount of carbon. In addition, the quantity of carbon is further defined with a feature "*excess quantity of carbon*". This feature adds a further complication, since a sufficient amount of carbon cannot be reliably determined, so it cannot be deduced as of when the amount is in excess. Furthermore, the claim no longer contains the requirement that the reaction product has to contain a reduced metal ion. Carbon could just be present in an amount that is theoretically sufficient to reduce the metal ion without effectively reducing it. The clarity objections raised in respect of claim 1 of the second auxiliary request cannot be considered as clearly overcome by this request.

Claim 1 of auxiliary request 5 is identical to claim 1 of the main request.

Claim 1 of auxiliary request 6 is identical to claim 1 of auxiliary request 3.

Auxiliary requests 3 to 6 cannot be considered as clearly or obviously allowable.

- 6.4 The Board concludes that auxiliary requests 3 to 6 are not admitted into the proceedings.

## Order

### For these reasons it is decided that:

1. The decision of the opposition division is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



C. Vodz

G. Rath

Decision electronically authenticated