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D E C I S I O N
of 26 October 2004

Case Number: T 0442/02 - 3.3.1

Application Number: 94929124.9

Publication Number: 0721445

IPC: C07C 31/30

Language of the proceedings: EN

Title of invention:
Improved method of preparation of lithium tertiary-butoxide

Patentee:
FMC CORPORATION

Opponent:
BASF Aktiengesellschaft Patente, Marken und Lizenzen

Headword:
Lithium tert-alkoxide/FMC

Relevant legal provisions:
EPC Art. 56

Keyword:
"All requests: inventive step (no) - alleged unexpected effect not shown - obvious process parameter"

Decisions cited:
T 0037/82, T 0197/86

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0442/02 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 26 October 2004

Appellant: (Proprietor of the patent)	FMC CORPORATION 1735 Market Street Philadelphia, PA 19103 (US)
Representative:	W.P. THOMPSON & CO. Coopers Building, Church Street Liverpool L1 3AB (GB)
Respondent: (Opponent)	BASF Aktiengesellschaft Patente, Marken und Lizenzen D-67056 Ludwigshafen (DE)
Representative:	-

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 11 March 2002 revoking European patent No. 0721445 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: A. J. Nuss
Members: P. P. Bracke
S. C. Perryman

Summary of Facts and Submissions

I. European patent No. 0 721 445 was granted with seventeen claims. The independent claims read:

"1. A process for preparing a solution of a lithium tertiary-alkoxide characterized by the steps of reacting, in a reaction vessel, lithium bulk metal pieces of a weight greater than 0.5 grams per piece, containing less than 0.6% by weight of sodium, with a tertiary alkyl alcohol containing 3 to 10 carbon atoms, in mole ratios of metal to alcohol ranging from 1 to 1 to 10 to 1 in a solvent selected from ethereal or hydrocarbon solvents under an inert atmosphere at an elevated temperature between 34.6°C and 100°C for 1 to 10 hours, cooling the product lithium tertiary-alkoxide and separating the product lithium tertiary-alkoxide solution from the unreacted lithium metal in the reaction vessel."

"15. A solution of lithium tert-alkoxide and a ethereal or hydrocarbon solvent or a mixture thereof, wherein the sodium content is less than 0.6 percent by weight in the lithium metal."

II. The Opposition Division revoked the patent due to lack of novelty of granted Claim 15 over the teaching of document

(2) Collection Czechoslov. Chem. Commun., Vol. 35, 1970, pages 733 to 736.

In the decision revoking the patent the Opposition Division expressed its finding that granted Claim 1 met the requirements of novelty and inventive step.

III. The Appellant (Proprietor of the patent) filed with letter of 5 July 2002 sets of claims titled "First alternative submission" and "Second alternative submission". In both sets Claim 1 was identical with granted Claim 1.

Furthermore, the Appellant submitted that granted Claim 15 was novel over the teaching of document (2) and that it could not be deduced from the prior art that lithium tertiary-alkoxides could be obtained in a satisfactory reaction time and yield by using lithium bulk metal pieces of a weight greater than 0.5 grams per piece and containing less than 0.6% by weight of sodium.

IV. With telefax of 24 September 2004, the Appellant announced that he would not be represented at the oral proceeding on 26 October 2004 and he asked for a decision taken on the basis of the written submissions. Moreover, in that telefax he specified that the set of claims according to the "Second alternative submission" filed with letter of 5 July 2002 corresponds to the granted set of claims but with Claims 15 and 16 deleted and Claim 17 renumbered accordingly.

V. In the written procedure and at the oral proceedings before the Board on 26 October 2004, the Respondent (Opponent) contested that with the data provided in the patent in suit it had been made plausible that an effect was obtained with the claimed process over the

complete claimed range. Therefore, the problem effectively solved by the claimed process could only be seen in providing a further process of preparing a solution of a lithium tertiary-alkoxide. Since lithium metal pieces of a weight greater than 0.5 g per piece and lithium metal having a sodium content of less than 0.6% by weight were generally known, the process of granted Claim 1 was obviously derivable from the cited prior art.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be maintained as main request as granted, or as first auxiliary request on the basis of Claims 1 to 17 of the first alternative submission submitted on 5 July 2002 or as second auxiliary request on the basis of Claims 1 to 14 and 17 as granted with the last claim renumbered as 15.

The Respondent requested that the appeal be dismissed.

VII. At the end of the oral proceedings the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 The Board cannot follow the finding of the Opposition Division that the disclosure of document (2) is novelty-destroying for granted Claim 15, since it may not be directly and unambiguously derived from document

(2) that the lithium tertiary-butoxide solutions obtained have a sodium content of less than 0.6 percent by weight in the lithium metal.

However, since the Board came to the conclusion that Claim 1 does not meet the requirement of inventive step, it is superfluous to give detailed reasoning on the novelty of Claims 1 and 15 as granted.

3. *Inventive step*

In accordance with the "problem-solution approach" applied by the Boards of Appeal to assess inventive step on an objective basis, it is in particular necessary to establish the closest state of the art forming the starting point, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art.

3.1.1 It was not contested that document (2) represents the closest state of the art.

Document (2) discloses on page 735 under the heading "Preparation of the Alkaline Metals Alkoxides Soluble in Tetrahydrofuran" combined with the data provided in the first line of Table I a process of preparing lithium tertiary-butoxide in a stream of purified argon (see "experimental" on page 735) by moderate boiling 1.2 g atom of lithium wire (approximately 0.5 mm in diameter) in 460 ml THF per mol tertiary-butanol during 15 hours and filtering the tertiary-butoxide solution.

3.1.2 The Appellant submitted that it was felt necessary to use small pieces of lithium in order to have a large surface area to aid reaction. Therefore, starting from document (2), the problem to be solved consisted in providing a process wherein larger pieces of lithium can be used without suffering the problem of greatly increased reaction time and/or reaction yield (see paragraph (8) of Appellant's letter of 2 January 2003).

3.1.3 The patent in suit claims to solve this problem by the process defined in Claim 1.

3.1.4 The next point to be considered in assessing inventive step is then whether it has been convincingly shown that by the process according to Claim 1 the problem underlying the patent in suit has effectively been solved over the complete claimed ranges.

According to the case law of the Boards of Appeal, in order to show an effect by comparison, the nature of the comparison must be such that the said effect is convincingly shown to have its origin in the distinguishing feature of the invention (T 197/86, OJ EPO 1989, 371, Reasons 6.1.3).

3.1.5 The Appellant repeatedly stated in his letter of 2 January 2003 that there were three distinguishing features between the process disclosed in document (2) and the claimed process, namely the sodium content of the lithium, the size of the lithium pieces and the molar ratio of lithium to alcohol. However, in the first line in Table I of document (2) it is unambiguously stated that 1.2 gram-atom lithium is used per mol of tertiary-butanol. As the gram-atom weight is

the amount of an atomic substance whose weight, in grams, is numerically equal to the atomic weight of that substance and a mol is the molecular weight of a substance expressed in grams, document (2) unambiguously discloses the use of lithium and tertiary-butanol in a molar ratio of 1.2.

As, thus, the only two distinguishing features between the process disclosed in document (2) and the claimed process are the sodium content and the size of the lithium bulk metal pieces, the question arises whether it has been made plausible with the only data available, namely those presented in Tables I to VI of the patent in suit, that the problem defined in point 3.1.2 has been effectively solved over the complete claimed ranges by selecting bulk lithium metal having a sodium content and a size as defined in the claimed process.

3.1.6 Table I contains neither yield nor reaction time data; the data provided in Table II are related to the use of lithium dispersions, not with lithium metal in bulk form as in the claimed process; the data provided in Table V are related to a process using catalysts, whereas Claim 1 is not restricted to processes wherein a catalyst is used; and the data in Table VI are only related to processes wherein lithium containing 0.0035% sodium is used, which does not enable any comparison relevant to what is claimed. Thus the data provided in Tables I, II, V and VI of the patent in suit are not suitable for making it plausible that the problem defined in point 3.1.2 above has effectively been solved.

3.1.7 Table III provides yield and reaction time data for the conversion of tertiary-butanol in boiling THF with lithium cubes of 1 cm square containing 0.0035 or 0.69% by weight of sodium and Table IV provides data for such conversion wherein lithium rods of 2.54 cm (0.5 inch) x 1 cm is used, which contains <0.01 or 0.74% by weight of sodium.

As Table III and Table IV provide only data for the conversion of tertiary-butanol with lithium very much below the claimed upper limit of 0.6% of sodium, those data are not suitable for showing that acceptable yields and reaction times are obtained by the use of lithium containing **any amount of sodium less than 0.6% by weight of sodium** and, thus, the criticality of the claimed 0.6% sodium content. Moreover, since none of the data provided in Tables III and IV concern the conversion of tertiary-butanol with lithium bulk metal pieces of a weight of 0.5 grams or less per piece, those data are also not suitable for showing the criticality of the weight of the lithium bulk metal pieces used.

3.1.8 Consequently, starting from document (2), the problem effectively solved by the claimed process can only be seen in the provision of a further process for preparing a solution of a lithium tertiary-alkoxide by converting a tertiary-alcohol with lithium.

3.1.9 It remains, thus, to be decided, whether in the light of the teachings of the cited documents a skilled person seeking to solve the problem defined in point 3.1.8 would have arrived at the process of Claim 1 in an obvious way or not.

3.1.10 From document (2) it may be deduced (see point 3.1.1 above) that lithium tertiary-butoxides may be prepared under an inert atmosphere by reacting lithium bulk metal with tertiary-butanol at a mole ratio of 1.2 to 1 in THF at the boiling point of THF (66°C) and separating the butoxide solution from the remaining solids. The only information about the lithium used is, that it is used in form of a wire with a diameter of approximately 0.5 mm without, however, indicating its purity grade.

However, as reported in the patent in suit (see page 3, lines 33 to 38) common commercially available lithium metal rods and ingots all have a weight greater than 0.5 grams per piece. Moreover, from the common general knowledge, as represented by document

(3) Ullmann's Encyclopedia of Industrial Chemistry, fifth edition, VCH Verlag-GmbH, Weinheim 1990, Band A15, pages 393 to 414

it is known that lithium metal of standard grade contains ca. 0.5% sodium while the purer battery grade lithium contains less than 200 ppm of sodium.

Thus, starting from the information given in document (2), a skilled person would have chosen standard grade lithium in a commercially available form in order to solve the problem as stated in point 3.1.8 above and thus come to the claimed process.

It is true, that the reaction of tertiary-butanol with lithium described in document (2) was conducted during

15 hours, whereas in the claimed process the reaction time is 1 to 10 hours. However, since the problem to be solved by the claimed process can only be seen as providing a further process (see point 3.1.8 above) without requiring any particular yield, the reaction time cannot be considered a relevant or critical feature in the claimed process, which contributes to the solution of the problem. Such features are, according to the established case law of the Boards of Appeal, not to be considered in assessing inventive step of a combination of features (T 37/82 OJ EPO 1984, 71, Reasons 3).

3.1.11 Consequently, the process of Claim 1 is an obvious solution to the problem underlying the patent in suit. Therefore, Claim 1 and, thus, the main request cannot be considered to meet the requirement of inventive step.

3.2 First, second and third auxiliary request

Since the wording of Claim 1 in any of those requests is identical with the wording of Claim 1 according to the main request, also those sets of claims cannot be considered to meet the requirement of inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar: The Chairman:

A. Wallrodt A. Nuss