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**Datasheet for the decision  
of 15 July 2014**

**Case Number:** T 0337/13 - 3.3.08

**Application Number:** 10180881.4

**Publication Number:** 2295545

**IPC:** C12N9/02, C12P7/06, C12G3/02

**Language of the proceedings:** EN

**Title of invention:**  
Fermentation methods and compositions

**Applicant:**  
Novozymes North America, Inc.

**Headword:**  
Ethanol production with Laccase/NOVOZYMES

**Relevant legal provisions:**  
EPC Art. 123(2), 54, 56

**Keyword:**  
Main request - requirements of the EPC met (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern  
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Chambres de recours**

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Case Number: T 0337/13 - 3.3.08

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.08**  
**of 15 July 2014**

**Appellant:** Novozymes North America, Inc.  
(Applicant) 77 Perry Chapel Church Road  
Franklinton, North Carolina 27525 (US)

**Representative:** Miles, John S.  
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**Decision under appeal:** **Decision of the Examining Division of the European Patent Office posted on 22 October 2012 refusing European patent application No. 10180881.4 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** M. Wieser  
**Members:** B. Stolz  
C. Heath

## **Summary of Facts and Submissions**

- I. The appeal lies against the decision of the examining division whereby European patent application No. 10180881.4, which is a divisional application of European patent application No. 07121010.8 (the parent application), which itself was a divisional application of original European patent application No. 03798662.7 (the grandparent application), was refused. The examining division decided that the main request and auxiliary requests 2, 5 and 6 did not meet the requirements of Art. 76(1) EPC, that the main request and auxiliary requests 1 to 3 lacked novelty, and that auxiliary requests 4 to 7 lacked an inventive step.
- II. With the grounds of appeal, the appellant (applicant) submitted a main request and auxiliary requests 1 to 7. These requests relate to the requests before the examining division as follows: MR (previous MR), AR1 (previous AR1), AR2 (new), AR3 (new), AR4 (previous AR2), AR5 (previous AR3), AR6 (previous AR7), AR7 (previous AR4).
- III. The appellant was summoned to oral proceedings. A communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA) was annexed to the summons, setting out the preliminary non-binding opinion of the board on some of the issues of the appeal proceedings.
- IV. In response to this communication, the appellant changed the order of the requests, making previous auxiliary request 4 its main request and renumbering the previous main request and auxiliary requests 1 to 3 as auxiliary requests 1 to 4, respectively. It maintained its request for oral proceedings only in the

event that Board found that the claims of the main request did not meet the requirements of the EPC.

V. Claims 1 to 3 of the main request read as follows:

- "1. A method for producing ethanol from starch-containing material, which method comprises a fermentation step, comprising contacting a fermenting microorganism or fermentation media used in the fermentation step with at least one laccase (EC 1.10.3.2), wherein the starch-containing material is selected from the group consisting of tubers, roots, whole grains, corns, cobs, wheat, barley, rye, milo or cereals.
2. The method of claim 1, wherein said microorganism is a yeast.
3. The method of claims 1 or 2, wherein said fermentation step is part of a simultaneous saccharification and fermentation process."

VI. The following documents are referred to in this decision:

D1: LARSSONS ET AL: "Comparison of Different Methods for the Detoxification of Lignocellulose Hydrolyzates of Spruce", APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY, vol. 77-79, 1 January 1999, pages 91-103

D5: EP 1 122 303, 08. August 2001

VII. Appellant's arguments, as far as relevant for the present decision, can be summarized as follows:

Article 76(1) EPC

The content of the grandparent application was contained in its entirety in the parent and the present application.

The patent application disclosed (and the same disclosure could be found verbatim in the parent application and the grandparent application) that: "Another aspect of the present invention relates to a fermentation process in which at least one laccase or laccase related enzyme is used in a fermentation process".

The patent application furthermore disclosed (this disclosure could be found verbatim in the corresponding paragraphs in the parent application and the grandparent application) that: "The fermentation processes described herein are preferably used in combination with liquefaction or saccharification processes. Any liquefaction or saccharification may be used in combination with the fermentation of the present invention. According to the present invention, the saccharification and liquefaction may be carried out simultaneously or separately with the fermentation process".

Thus, there was a direct and unambiguous disclosure that liquefaction or saccharification processes could be used simultaneously with any of the fermentation processes of the invention.

Furthermore, it was perfectly clear from reading these passages that the fermentation step containing laccase could be part of a simultaneous saccharification and fermentation process.

Basis for the feature "comprising contacting a fermenting microorganism or fermentation media used in the fermentation step with at least one laccase (EC 1.10.3.2)" could be found in paragraph [0090] of the patent application, and the corresponding paragraphs of the parent and the grandparent application, from which it was clear that the laccase was present during fermentation. Example 14 provided further support. The starch containing materials were mentioned in paragraph [0023] of the patent application and the corresponding paragraphs in the earlier applications.

#### Article 54 EPC

According to claim 1, laccase was present in the fermentation step. Document D1 disclosed the production of ethanol from spruce chips but not from any of the substrates mentioned in claim 1. Document D5 disclosed that laccase was introduced in the mashing step of barley but it was destroyed in the boiling step which preceded fermentation.

#### Article 56 EPC

Document D5 disclosed the production of beer from barley with improved flavour stability. It disclosed in particular that the presence of laccase during the mashing stage of brewing prevented the formation of aldehydes that impart a cardboard flavour to beer. There was however no suggestion in document D5 that the addition of laccase in the fermentation step increased the yield of ethanol. Nor could such a suggestion be found in document D1 which disclosed the addition of laccase to hydrolysates of wood chips to remove phenolic compounds.

VIII. The appellant requests that the decision under appeal be set aside and a patent be granted on the basis of the main request, or in the alternative on the basis of one of auxiliary requests 1 to 7. Should the board decide not to allow the main request, oral proceedings are requested.

### **Reasons for the Decision**

Main request

1. The main request corresponds to auxiliary request 2 before the examining division, which, in the decision under appeal, was found to contravene the requirements of Articles 76(1) and 54 EPC.

Article 76(1) EPC

2. The present patent application is a divisional application of European patent application No. 07121010.8 (the parent application, published as EP 1905821), which itself was a divisional application of European patent application No. 03798662.7 (the grandparent application, published as EP 1556475).
3. The examining division did not raise any objections against claims 1 and 2 under the provisions of Article 76(1) EPC and the board sees no need to raise any of its own motion.

The examining division decided however that claim 3 covered subject matter which was not disclosed in the earlier applications as filed. In particular, it concluded that the use of a laccase in a simultaneous

saccharification and fermentation process was not disclosed.

4. The description of the present application is literally identical to the description of the parent application which itself is literally identical to the description **and** claims 1 to 33 of the grandparent application. The description of the present application refers to claims 1 to 33 of the grandparent application as "Preferred Embodiments".

For the purpose of Article 76(1) EPC it is therefore sufficient to demonstrate direct and unambiguous disclosure of the subject matter of claim 3 in the description of any of the present, parent or grandparent applications. In the following, reference is made to the paragraphs as numbered in the present application.

5. Preferred embodiment 27, by reference to preferred embodiment 26, (cf paragraph [130]) refers to "a method for producing ethanol, which method comprises a fermentation step, comprising contacting a fermenting microorganism or fermentation media with at least one laccase enzyme", paragraph [0091] defines laccase as an enzyme of EC class EC 1.10.3.2., and paragraph [0023] lists "starch containing materials, such as tubers, roots, whole grains, corns, cobs, wheat, barley rye, milo or cereals", as one of several suitable source materials in the fermentation processes of the invention. Furthermore, "the fermentation processes described herein are preferably used in combination with liquefaction or saccharification processes" (cf. paragraph [0059]), and "the most widely used process in ethanol production is the simultaneous saccharification and fermentation (SSF) process" (cf. paragraph [0071]).



6. The board concludes therefore (see point 4 above) that the combination of features of claim 3 is directly and unambiguously derivable from the parent and the grandparent application.
7. In view of the above, claims 1 to 3 meet the requirements of Article 76(1) EPC.

Article 123(2) EPC

8. Since the subject matter of claims 1 to 3 is directly and unambiguously derivable from the description as originally filed (cf. points 4 to 6) above, the board is satisfied that the requirements of Article 123(2) EPC are met.

Articles 83 and 84 EPC

9. The examining division raised no objections under these Articles of the EPC and the board sees no need to raise any on its own motion.

Article 54 EPC

10. Document D1 refers to the production of ethanol from hydrolysates of wood chips which are not encompassed by the starch containing materials listed in claim 1.
11. Document D5 discloses the production of beer and hence ethanol from barley. The steps followed in the production of beer are explained in paragraphs [0002] to [0008] of document D5. According to these paragraphs, barley is malted, the malt is mixed with water and enzymes, and the dissolved product from this mashing step, the wort, is boiled with hops. During

boiling, the enzymes are destroyed. After cooling of the wort, yeast is added for fermentation.

12. According to document D5, laccase is added prior to and/or during mashing (cf. paragraph [0022]).

Since the laccase added during the mashing step is inactivated by the subsequent boiling step, it has no effect in the fermentation step which takes place after the boiling step. Inactivated (denatured) laccase may still be present in the fermentation medium but it cannot perform its enzymatic function as required by the method of claim 1. The method of document D5 falls therefore outside the scope of the claims.

13. Hence, the subject matter of claims 1 to 3 is novel.

#### Article 56 EPC

14. Document D5 represents the closest state of the art. As mentioned above, it discloses the production of ethanol (beer) from barley, one of the substrates listed in claim 1.

15. The technical problem underlying the present invention is seen in the provision of an improved method of producing ethanol from one of the starch containing substrates listed in claim 1.

16. As a solution to this problem, the application proposes the method of claim 1, characterized by a fermentation step in the presence of laccase.

17. According to Example 14, the percentage of ethanol produced from corn starch increased from 17.83% to 18.86% when laccase was added in a method of

- simultaneous liquefaction, saccharification and fermentation. The board is therefore satisfied that the underlying technical problem is indeed solved.
18. It remains to be established whether the claimed method involves an inventive step.
  19. In document D5, laccase was added to improve flavour stability, and the laccase was inactivated upon boiling of the wort. The document is absolutely silent about any other use of laccase. Therefore, the claimed solution, comprising the use of laccase in the fermentation step, is not obvious on the basis of document D5 alone.
  20. Document D1 discloses the use of laccase in a method of producing ethanol from wood (spruce) chips. Wood needs to be pretreated with for instance dilute sulfuric acid to make sugar molecules available for fermentation. According to document D1, laccase is added to a dilute acid hydrolysate of spruce to remove inhibitor substances which are toxic to the fermenting microorganism. Laccase specifically removes phenolic compounds which are products of the dilute acid hydrolysis of lignocellulose (page 92, 1st paragraph).
  21. The starch containing materials listed in claim 1 are however not of the lignocellulosic type and do not require an acid hydrolysis treatment. As a consequence, the skilled person trying to solve the above mentioned problem had no reason to expect the presence of inhibitory phenolic compounds in the fermentation broth and to amend the method disclosed in the closest prior art document, D5, based on the teaching of document D1.

Therefore, the skilled person would not have arrived at the claimed solution in an obvious way by combining the disclosure of document D5 with that of document D1 or any other document on file.

22. The subject matter of the main request thus involves an inventive step.

23. Since the main request meets the requirements of the EPC, there is no need to hold oral proceedings (cf. item VIII, above).

## Order

### For these reasons it is decided that:

1. The case is remitted to the examining division with the order to grant a patent on the basis of  
  
the main request submitted with letter of 19 June 2014,  
and  
  
a description yet to be adapted thereto.

The Registrar:

The Chairman:



A. Wolinski

M. Wieser

Decision electronically authenticated