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Datasheet for the decision of 8 June 2022

Case Number: T 2911/19 - 3.3.08

Application Number: 05736399.6

Publication Number: 1735454

IPC: C12P19/04, C12P7/06

Language of the proceedings: EN

Title of invention:
METHODS FOR DEGRADING OR CONVERTING PLANT CELL WALL POLYSACCHARIDES

Patent Proprietor:
Novozymes, Inc.

Opponents:
V.O.
Gevers & Ores

Headword:
Beta-glucosidase/NOVOZYMES

Relevant legal provisions:
EPC Art. 54, 54(3), 56, 87, 100(a), 100(b), 100(c)
EPC R. 106
RPBA Art. 12(4)

Keyword:

Patent as granted - added matter - (no)
Admittance of experimental data not admitted in opposition proceedings - (no)
Objection under Rule 106 EPC - dismissed
Sufficiency of disclosure - (yes)
Validity of the priority - (yes)
Novelty - (yes)
Inventive step - (yes)
Admittance of late-filed evidence and lines of attack - (no)

Decisions cited:

T 1014/07, T 1791/08, T 0192/09, T 1255/13, T 0066/14, T 0628/14

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Case Number: T 2911/19 - 3.3.08

D E C I S I O N
of Technical Board of Appeal 3.3.08
of 8 June 2022

Appellant: (Opponent 1)	V.O. Postfach 87930 Carmegieplein 5 2508 DH Den Haag (NL)
Representative:	Hermann, Bettina Celia V.O. Rindermarkt 5 80331 München (DE)
Respondent: (Patent Proprietor)	Novozymes, Inc. 1445 Drew Avenue Davis, CA 95616 (US)
Representative:	Didmon, Mark Potter Clarkson The Belgrave Centre Talbot Street Nottingham NG1 5GG (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 August 2019 rejecting the opposition filed against European patent No. 1735454 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	B. Stolz
Members:	M. R. Vega Laso
	F. Bostedt

Summary of Facts and Submissions

I. The appeal lies from the decision of an opposition division posted on 30 August 2019 rejecting the opposition against European patent No. 1 735 454 with the title "Methods for degrading or converting plant cell wall polysaccharides". The patent was granted from the European application No. 05736399.6 filed under the Patent Cooperation Treaty claiming the priority of the US application No. 60/556,779. In the present decision, references to the "the application as filed" are to the International publication WO 2005/100582 A2.

II. Independent claims 1 and 12 of the patent as granted read as follows:

"1. A method for degrading or converting plant cell wall polysaccharides into one or more sugars, comprising: treating the plant cell wall polysaccharides with an effective amount of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism, wherein the recombinant *Trichoderma* microorganism expresses one or more heterologous genes encoding beta-glucosidase.

12. A method for producing one or more organic substances, comprising:

(a) saccharifying plant cell wall polysaccharides with an effective amount of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism, wherein the recombinant *Trichoderma* microorganism expresses one or more heterologous genes encoding beta-glucosidase;

(b) fermenting the saccharified material of step (a) with one or more fermenting microoganisms; and
(c) recovering the one or more organic substances from the fermentation."

Dependent claims 2 to 11 and 13 to 21 are directed to various embodiments of the method of, respectively, claim 1 and claim 12.

III. Two oppositions to the grant of the patent were filed based on the grounds for opposition under Article 100(a) in conjunction with Articles 54 and 56, and under Article 100(b) and (c) EPC. The opposition filed by opponent 02 was withdrawn on 7 August 2018 during the opposition procedure.

IV. After the rejection of the opposition, the remaining opponent (appellant) filed an appeal and submitted a statement setting out the grounds of appeal, together with new documentary evidence.

V. The patent proprietor (respondent) replied to the statement of grounds of appeal and submitted a declaration including experimental data.

VI. Pursuant to their request, the parties were summoned to oral proceedings before the board.

VII. In a communication sent in preparation for the oral proceedings, the board drew attention to matters which seemed to be of special significance and expressed a provisional opinion on some of the issues to be discussed.

VIII. Oral proceedings were held on 8 June 2022. During the oral proceedings, the appellant raised the following objection pursuant to Rule 106 EPC:

"*Petition for review by the Enlarged Board of Appeal pursuant to Art. 112a EPC*

Opponent files the request for review of the decision of the Board of Appeal on the rejection of the admission of experimental data (D20). The prima facie relevance of the data was shown in detail in opposition and appeal proceedings. The data were filed in response to the summons to oral opposition proceedings, more than one year in advance to the oral proceedings.

The Opposition Division as well as the Board of Appeal rejected the data due to late filing without taking the relevance of the data regarding the requirements under Art. 83 EPC into consideration. This represents an infringement of the right to be hear pursuant to Art. 113(1) EPC and the petition for review by the Enlarged Board of Appeal is requested pursuant to Art. 112a(2c) EPC."

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

(1): US 5,997,913, published on 7 December 1999;

(2): US 6,939,704 B1, published on 6 September 2005;

(3): D. J. Schell *et al.*, 1990, Applied Biochemistry and Biotechnology, 1990, Vol. 24/25, pages 287 to 297;

(4): M. Takagi *et al.*, 1977, Proc. Bioconversion Symp., IIT Delhi, pages 551 to 571;

(5): WO 91/18090 A1, published on 28 November 1991;

(7): C. C. Barnett *et al.*, June 1991, Biotechnology, Vol. 9, pages 562 to 567;

(8): EP 1 625 219 A0, published as WO 2004/111228 on 23 December 2004;

(10): US patent No. 6,015,703, published on 18 January 2000;

(15): S. Keränen and M. Penttilä, 1995, Current Opinion in Biotechnology, Vol. 6, pages 534 to 537;

(16): P. L. Bergquist *et al.*, 2004, Thermophiles 2003, pages 293 to 297;

(18): J. M. Uusitalo *et al.*, 1991, Journal of Biotechnology, Vol. 17, pages 35 to 50;

(20): "Experiments regarding the expression of beta-glucosidases of different microorganisms in *Trichoderma reesei* RutC30", neither dated nor signed;

(22): Provisional US application No. 60/556,779;

(25): Declaration of Jeffrey Shasky, dated 1 July 2019;

(27): M. K. Tahoun and A. A. Ibrahim, 1999, Z. Lebensm. Unters. Forsch. A, Vol. 208, pages 65 to 68;

(29): J. D. Ferchak *et al.*, 1980, Biotechnology and Bioengineering, Vol. XXII, pages 1527 to 1542; and

(30): Y. Bhatia *et al.*, 2002, Critical Reviews in Biotechnology, Vol. 22, No. 4, pages 375 to 407.

X. The submissions made by the appellant, insofar as relevant to the present decision, were essentially as follows:

Article 100(c) EPC – added matter

The opposition division's assessment of added matter was not correct. The description and claims of the application as filed did not provide a basis for methods defined by a combination of a *Trichoderma* microorganism and a beta-glucosidase, like in claims 1 and 12 of the patent as granted. *Trichoderma* was disclosed in the application as filed only as a member of a list of preferred host microorganisms, and claims 5 to 8 of the application as filed specified equally relevant heterologous genes encoding endoglucanase, cellobiohydrolase or glucosidase, this being equivalent to a list of these genes in a single claim. Hence, to arrive at the subject-matter of claims 1 and 12 a skilled person had to combine elements selected from two lists.

The application as filed provided, at most, a basis for a combination of *Trichoderma reesei* RutC30, the fungal strain used in the examples, and an enzyme selected from endoglucanase, cellobiohydrolase and glucosidase. Claims 1 and 12 reciting *Trichoderma* represented a generalization of that disclosure. Hence, the subject-matter of claims 1 and 12 as well as the subject-matter

of dependent claims 2 to 11 and 13 to 21 extended beyond the content of the application as filed.

Article 100(b) EPC – sufficiency of disclosure

The opposition division erred in finding that the invention defined in claim 1 was disclosed in the patent in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

A person skilled in the art would not be able to obtain substantially all embodiments falling within the scope of the claims. The patent disclosed only one way of carrying out the invention by using *T. reesei* SMA 135-04, a specific *Trichoderma* strain expressing a specific beta-glucosidase linked to a specific non-native signal sequence. In contrast, the beta-glucosidase activity of the *T. reesei* SMA 130 strain, which comprised a sequence coding for beta-glucosidase, was not higher than that of the parent *Trichoderma reesei* RutC30 strain. Thus, for finding a suitable recombinant *Trichoderma* microorganism to rework the claimed method, the skilled person had to rely on chance. This was confirmed by the experimental data provided in document (20). None of documents (1), (5), (7) or (10) referred to in the decision under appeal taught the use of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism and thus could not fill the gap in the disclosure of the patent.

There were numerous parameters that influenced the expression of beta-glucosidase and its activity. As was apparent from the patent itself, and also suggested in document (25), the particular beta-glucosidase gene and the signal sequence used in the examples of the patent could be important factors for the successful beta-

glucosidase expression in *T. reesei* SMA 135. However, there was no hint in the patent of how the beta-glucosidase gene and the signal sequence were to be selected. Moreover, cloning and expressing heterologous genes in *T. reesei* was not trivial, as confirmed by the examples of the patent.

Admittance of document (20) into the proceedings

The experimental evidence of document (20) had been filed in due time in opposition proceedings, and the opposition division should have admitted it. Since the examples of the patent already showed that the invention could not be reworked based solely on the disclosure of the patent, it had not been expected initially that additional experimental data would be necessary to prove the lack of sufficient disclosure. As in the annex to the summons to oral proceedings the opposition division expressed the provisional opinion that the invention was sufficiently disclosed in the patent, additional experimental evidence had to be produced within a relatively short period of time. The evidence had been filed and received by the present respondent two months before the oral proceedings. Having the constructs described in the examples at hand and access to other *Trichoderma* strains expressing beta-glucosidase, the respondent had had sufficient time and opportunity to show that the invention could be reworked over the whole scope of the claims.

Moreover, document (20) was *prima facie* relevant. The experimental results therein showed that *Trichoderma* microorganisms comprising one or more heterologous genes expressing beta-glucosidase were regularly not suitable for reworking the method of claim 1 or 12. It confirmed that the effect observed for

T. reesei SMA 135 was more an exception than the rule, and that a skilled person had to rely on chance to rework the claimed methods.

Article 100(a) in conjunction with Article 54 EPC

Article 87 EPC – validity of the priority

The priority application (document (22)) disclosed the *T. reesei* RutC30 strain as the most preferred host, but did not disclose, generally, a recombinant *Trichoderma* microorganism expressing one or more heterologous genes encoding beta-glucosidase. Since the priority right from the prior application could not be validly claimed, the relevant date was the filing date and, consequently, document (8) formed part of the state of the art under Article 54(2) EPC.

Article 54 EPC – novelty

Document (8)

Even if the priority of document (22) was validly claimed, document (8) anticipated the claimed subject-matter. The analysis of the content of document (8) in the decision under appeal was incorrect. Document (8) was a patent application describing methods for producing secreted polypeptides by a recombinant fungal cell. According to claims 25, 26 and 27, the polypeptide was a beta-glucosidase, and according to claims 28, 29, 31 and 32 the fungal cell was a *Trichoderma* cell, for example *T. reesei*. Claims 62 and 63 related to a method for degrading or converting a cellulose- and/or hemicellulose-containing biomass. Spent whole fermentation broth of *Trichoderma* cells was described on page 22, lines 3 and 4.

Document (1)

Claims 1 to 5, 9 to 14, 20 and 21 lacked novelty over the content of document (1). The opposition division had found that document (1) did not describe a method using spent whole fermentation broth of a recombinant *Trichoderma* microorganism. However, in column 16, lines 44 to 46 of document (1) it was stated that the transformants could be isolated from the culture media and used in a variety of applications. It was implicit in this statement that spent whole fermentation broth could be used.

Admittance of document (27) into the proceedings

Even if document (27) were considered to be late filed, this document had to be nevertheless admitted into the appeal proceedings because it was *prima facie* relevant to the assessment of novelty.

Article 100(a) in conjunction with Article 56 EPC

Document (3) as the closest state of the art

The claimed subject-matter did not involve an inventive step in view of the teachings of document (3) alone or in combination with document (1). Document (3) described the use of spent whole fermentation broth of mutated *T. reesei* strains expressing beta-glucosidase in a method for degrading or converting cellulose. The sole difference between the method of document (3) and the method of claim 1 of the patent was that in the latter a recombinant *T. reesei* strain was used. The problem to be solved was the provision of alternative

T. reesei having at least comparable beta-glucosidase activity.

The problem was not solved over the whole scope of the claims. The experimental results in the patent showed an increased beta-glucosidase activity in *T. reesei* SMA 135, but did not show that, when used in a method for degrading or converting plant cell wall polysaccharides into sugars, spent whole fermentation broth of that strain performed better than cell-free broth. Moreover, the experimental results in document (20) showed that beta-glucosidase from various microorganisms were not expressed in *T. reesei* RutC30. There was no evidence on file that expression of any beta-glucosidase in a *Trichoderma* microorganism - other than that in the examples of the patent – resulted in the plant cell wall polysaccharides being degraded or converted into one or more sugars according to claim 1, or one or more organic substances being produced according to claim 12. Hence, it was highly questionable whether the alleged invention was associated with any technical effect. Alone for this reason, inventive step had to be denied.

Moreover, it was stated in document (3) that the best performance in saccharification and fermentation was attained by the batch with the highest beta-glucosidase content, and that the performance of every batch was enhanced by the addition of beta-glucosidase. Thus, the skilled person would have sought to further improve the expression of beta-glucosidase by expressing of one or more heterologous genes encoding beta-glucosidase in a *Trichoderma* microorganism.

The opposition division erroneously found that a skilled person reading document (3) would not be

motivated to use alternative genetic modifications, even if such modifications were well known. The finding was based on an incorrect assessment of the technical knowledge of the skilled person. Document (29) showed that, when document (3) was published, the use of spent whole fermentation broth of microorganisms, in particular of *T. reesei*, for degrading or converting plant cell wall polysaccharides into sugars had been well known. At the filing date of the patent, a person skilled in the art had been well aware of alternative technologies for genetic modification such as recombination. Thus, when read by a skilled person having this general knowledge, document (3) rendered the subject-matter of claims 1 to 3 and 12 to 14 obvious.

Moreover, the subject matter of claims 1 to 3, 6, 9, 12 to 14, 17, 20 and 21 lacked an inventive step over a combination of documents (3) and (1). Document (1) described beta-glucosidases as an essential component of the cellulase system, and taught expression of extracellular beta-glucosidase in a filamentous fungus such as *T. reesei*. In view of the statement in document (3) that many mutants had been developed to improve the release of beta-glucosidase into the culture broth, the skilled person was motivated to take heterologous genes encoding beta-glucosidase as taught in document (1) into account.

Document (1) as the closest state of the art

Starting from document (1) and in view of the teachings of document (4), (5) or (30) relating to the use of spent whole fermentation broth, the skilled person arrived at a method as defined in claim 1 or claim 12 of the patent. Hence, the claimed subject-matter lacked

inventive step over document (1) combined with any of documents (4), (5) and (30).

Admittance of documents (29) and (30)

Documents (29) and (30), which had been filed in response to the decision under appeal, should be admitted into the proceedings. They described basic technical knowledge of a person skilled in the art previous to and at the filing date of the patent which had not been correctly taken into consideration by the opposition division.

XI. The submissions made by the respondent, insofar as relevant to the present decision, may be summarized as follows:

Article 100(c) EPC – added matter

Claims 1 and 12 did not present the skilled person with any information that extended beyond the content of the application as filed. Page 9, lines 1 and 2, and claims 8 and 28 of the application made it clear that a preferred aspect of the invention involved a microorganism comprising a heterologous gene encoding beta-glucosidase. On page 8, lines 12 to 14 and 26 to 32 of the application, it was stated that the microorganism could be *Trichoderma*, and a number of species and strains of *Trichoderma* were disclosed. Examples 7 to 10 provided a clear pointer to the combination of the two features.

Article 100(b) EPC – sufficiency of disclosure

The findings in the decision under appeal were correct. Only speculative questions about the *T. reesei* SMA 130

strain disclosed in the examples of the patent, but no serious doubts substantiated by verifiable facts had been raised by the appellant to support the objection of lack of sufficient disclosure.

Admittance of document (20) into the proceedings

Document (20) had been submitted late in opposition proceedings and was not admitted by the opposition division. Even though it had been filed on the Rule 116 EPC deadline, the nature of document (20) meant that the patent proprietor was effectively denied the chance to properly consider and react to it, and deprived of the chance to perform counter-experiments. It had been entirely foreseeable from the outset of the opposition procedure that experimental data were required to substantiate the objection of lack of sufficient disclosure.

Moreover, document (20) did not support the allegation that a skilled person could not express heterologous beta-glucosidase in *Trichoderma*, nor provided any credible evidence that the disclosure in the patent was insufficient. Hence, document (20) was not *prima facie* relevant and should not be admitted in appeal proceedings.

Article 100(a) in conjunction with Article 54 EPC

Article 87 EPC – validity of the priority

Since the allegations in relation to the disclosure in the priority application were essentially the same as those concerning added matter, for the same reasons given in that context the priority application related

to the "same invention" as the one defined in the claims of the patent as granted.

Article 54 EPC – novelty

Document (1)

There was no direct and unambiguous disclosure in document (1) of *Trichoderma* expressing a heterologous beta-glucosidase. The allegation that the use of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism was implicitly disclosed in document (1) was based on a misreading of the document and was ill-founded.

Document (8)

The opposition division correctly found that document (8) did not destroy the novelty of the claimed methods. The same reasons given by the opposition division in connection with the question whether document (8) was the first patent application in respect of the invention, applied to the assessment of novelty over this document.

Admittance of document (27) into the proceedings

Document (27) and the associated arguments should be found inadmissible and disregarded because the reasons given by the appellant did not excuse their late submission. The document could (and should) have been filed earlier and was not *prima facie* relevant for novelty.

Article 100(a) in conjunction with Article 56 EPC

Document (3) as the closest state of the art

The opposition division had correctly found that the technical problem of providing an alternative method for the degradation and conversion of plant cell wall polysaccharides was solved by the claimed invention. Appellant's argument that degradation or conversion of plant cell wall polysaccharides could not be achieved for all of the *Trichoderma* species encompassed by the claims was not only ill-founded, but also related to Article 83 EPC rather than to Article 56 EPC. Example 10 of the patent demonstrated that the invention could be performed for an exemplary *Trichoderma* strain. It was entirely reasonable to expect that other *Trichoderma* strains having a heterologous beta-glucosidase would also result in a better cellulase preparation.

The allegation of lack of inventive step over document (3) impermissibly relied on hindsight knowledge of the invention, by piecing together the features of claim 1 from different documents of the state of the art. Document (3) pointed away from the claimed invention because its authors clearly stated that organisms other than *Trichoderma* should be used.

The use of spent whole fermentation broth as described in document (3), and the use of genetically-engineered *Trichoderma* microorganisms having improved enzyme activities as described in documents (1), (5), (7) and (10) were two parallel approaches developed in the art to improve saccharification of cellulosic material. It was not straightforward to combine those two approaches. Even though document (3) had been available

to the authors of the later documents (1), (5), (7) and (10), none of these documents taught or suggested using whole fermentation broth.

Document (1) as the closest state of the art

Document (1) was not directed to the same purpose as the invention and, therefore, could not be regarded as the closest state of the art.

Admittance of documents (29) and (30) and new line of attack

Documents (29) and (30) were late filed and not more relevant than other documents already on file. Therefore, the documents and the arguments based on them had to be disregarded by the board.

XII. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

XIII. The respondent requested that the appeal be dismissed.

Reasons for the Decision

Article 100(c) EPC – added matter

1. In the decision under appeal, the opposition division found that the method according to claim 1 was directly and unambiguously derivable from dependent claim 8 in combination with the passage on page 8, lines 12 to 14 of the application as filed.

2. The opposition division's finding is correct. Claim 1 of the application as filed is directed to a method for

degrading or converting plant cell wall polysaccharides into one or more products by treating the polysaccharides with an effective amount of a spent whole fermentation broth of a recombinant microorganism which expresses one or more heterologous genes encoding enzymes which degrade or convert the plant cell wall polysaccharides. Claim 8 of the application as filed, which depends directly from claim 1, is a distinct, clear and unambiguous disclosure of an embodiment of the method according to claim 1 which is characterized by the feature that the heterologous gene encodes a beta-glucosidase.

3. Contrary to appellant's view, a person skilled in the art does not need to choose beta-glucosidase from any list of enzymes, because the feature in question can be derived, clearly and unmistakably, from claim 8 of the application as filed. In the light of the individualized disclosure in claim 8, it is immaterial that claim 4 of the application as filed recites beta-glucosidase together with three further enzymes, and that claims 5 to 7 are directed to embodiments of the claimed method in which each of the other three enzymes is expressed by the recombinant microorganism.

4. The application as filed discloses a *Trichoderma* microorganism as an element of a list of filamentous fungi hosts characterized as "a more preferred aspect" of the invention (see the passage on page 8, lines 12 to 14 of the application as filed under the heading "Recombinant Microorganisms" starting on page 7, line 8). The fact that the application as filed discloses *Trichoderma reesei* RutC30 as the host microorganism in "a most preferred aspect" of the invention, and that this strain is used in the experiments described in the examples of the

application, does not invalidate the clear and unambiguous more general disclosure of a strain of the genus *Trichoderma* as the host microorganism.

5. Like the opposition division (see section 13.1 of the decision under appeal), the board does not share appellant's view that the features specified in claim 1 of the patent as granted result from a combination of selections from two lists. In the light of the disclosure of beta-glucosidase as encoded enzyme in claim 8 of the application as filed, only the selection of a *Trichoderma* strain from the list of fungal hosts disclosed on page 8, lines 12 to 14 is required for arriving at the claimed subject-matter of claim 1.

6. Nor does the board share appellant's view that the subject-matter of claim 1 is an impermissible generalization of the examples of the application as filed. The disclosure of a particular embodiment in the examples does not represent a limitation to the general disclosure in dependent claim 8 and the passage on page 8, lines 12 to 14, but rather a pointer to the specific combination of the features which characterizes the method of claim 1 of the patent as granted.

7. For these reasons, the board concludes that a method as defined in claim 1 does not extend beyond the content of the application as filed. The same applies, *mutatis mutandis*, to the method of claim 12 which can be clearly and unambiguously derived from claim 28 of the application as filed in combination with the disclosure on page 8, lines 12 to 14 of a *Trichoderma* strain as the host microorganism.

8. The opposition division's adverse findings on the objection of added matter concerning the subject-matter of claims 2, 5 and 7 were not contested by the appellant.

9. Hence, the ground for opposition of Article 100(c) EPC does not prejudice the maintenance of the patent as granted.

Article 100(b) EPC

Admittance of document (20) into the proceedings

10. Pursuant to Article 114(2) EPC, the European Patent Office may disregard facts or evidence which are not submitted in due time by the parties concerned.

11. Document (20), an experimental report on the expression of beta-glucosidase genes from different microorganisms in *Trichoderma reesei* RutC30, was filed by the opponent (present appellant) two months before the oral proceedings before the opposition division, i.e. on the final date set pursuant to Rule 116(1) EPC. The opposition division did not admit document (20) on the grounds that the document had been submitted late, and that the experimental data therein were *prima facie* of no relevance for the claimed invention and therefore unlikely to have an impact on the decision to be taken (see section 24.2.3 of the decision under appeal).

12. These findings were contested by the appellant. However, appellant's arguments fail to persuade the board that the opposition division's decision to disregard document (20) was not correct.

13. Like the opposition division, the board considers that the experimental evidence in document (20) was not submitted in due time. Document (20) was filed to support the allegation that, at the relevant date, a person skilled in the art was not able to obtain substantially all embodiments falling within the scope of the claims. While the ground for opposition of Article 100(b) EPC had been raised in the notice of opposition, this particular objection and the experimental data purportedly supporting it were submitted for the first time at such a late stage of the opposition proceedings that the patent proprietor would not have been able to conduct counter-experiments and submit the results before the date of the scheduled oral proceedings.

14. Even though document (20) was filed on the final date set by the opposition division pursuant to Rule 116(1) EPC, this does not necessarily mean that the evidence was submitted in due time within the meaning of Article 114(2) EPC. According to established case law of the Boards of Appeal, evidence first submitted by an opponent after expiry of the nine-month period under Article 99(1) EPC is generally to be regarded as not filed in due time for the purpose of Article 114(2) EPC. As stated in decision T 66/14 of 15 November 2016 (see point 2.3 of the reasons), the final date set by the opposition division pursuant to Rule 116(1) EPC should not be regarded as opening a fresh period during which new evidence could be filed without being treated as "late", i.e. as being filed not in due time within the meaning of Article 114(2) EPC.

15. Contrary to appellant's view, the fact that the opposition division expressed an adverse preliminary

opinion on the objection of lack of sufficient disclosure in the communication accompanying the summons to oral proceedings, could not justify the belated submission of new experimental evidence, because the opposition division did not raise any new aspects to which the appellant would have needed to react (see, e.g., decision T 628/14 of 30 June 2016, point 1.2 of the reasons).

16. Appellant's suggestion that, if the patent proprietor had wished to react to document (20) by conducting counter-experiments, it could have requested postponement of the oral proceedings, is misguided. Apart from the fact that postponing scheduled oral proceedings runs counter to procedural efficiency and the public interest in having the matter decided as expeditiously as possible, the possibility to postpone scheduled oral proceedings cannot serve as an excuse for the failure to submit evidence in due time.

17. The appellant argued further that the submission of experimental data at a late stage of the opposition proceedings did not represent a procedural abuse, and referred to decision T 192/09 of 25 November 2011. However, the circumstances underlying that decision are not comparable to those in the present appeal. In the cited decision, the experimental data were filed in accordance with the instructions of the board of appeal and in response to a communication issued by a board drawing attention to specific deficiencies of data submitted already in opposition proceedings (see sections 2.1 and 2.2. of the Reasons). For this reason alone, the situation is not comparable to the present case. In addition, the nature of the invention and the time and effort required for conducting counter-experiments differed substantially from those in the

present case. The findings in the cited decision are therefore not applicable to the question of admittance of document (20) in the present case.

18. As is apparent from section 24.2.3 of the decision under appeal, the opposition division exercised its discretion to disregard document (20) taking into account not only the relevance of the document for the claimed invention, but also the likelihood that the consideration of the experimental data therein would have an impact on the decision to be taken. In the board's view, the opposition division applied the correct criteria in a reasonable manner, and gave sufficient reasons for its exercise of discretion in the decision under appeal.

19. In view of the above, the board sees no reason to overturn the discretionary decision of the opposition division.

20. Nor does the board see any reason to exercise its own discretion under Article 12(4) RPBA 2007 to admit into the appeal proceedings either document (20) or appellant's submissions relying on the experimental data provided in this document.

21. While the appellant contended that the experimental data in document (20) showed that several beta-glucosidases from different microorganisms cannot be expressed in *Trichoderma reesei* RutC30, the board has serious doubts as to the probative value of the provided data.

22. In the experiments described in document (20) *Trichoderma reesei* RutC30 was transformed with various expression vectors corresponding to the pSMai135 vector

described in the patent, each vector including a gene encoding a beta-glucosidase from a different microorganism (SEQ01-SEQ05). It should be noted that the pSMai135 is an integrative plasmid which cannot replicate independently in *Trichoderma* and therefore must be integrated into the host genome. However, document (20) provides no evidence whatsoever that any of the heterologous beta-glucosidase genes of SEQ01-SEQ05 was integrated into the genome of the transformants shown in Figures 1 and 2.

23. Moreover, document (20) does not indicate how many transformants were analysed for each of the vectors including a beta-glucosidase gene of SEQ01-SEQ05. The fact that lack of beta-glucosidase expression is only shown in a **single** transformant for each of the vectors raises doubts as to the significance of the results. It is well known in the art that the level of expression of a heterologous gene integrated into the genome of a fungal host can vary substantially between different transformants obtained in the same transformation experiment, and depends on *inter alia* the site of the genome where the gene is integrated. Hence, in order to ascertain whether a heterologous gene is expressed in a host, several transformants – up to hundreds – need to be analysed. The negative result of the analysis of a single transformant for each construct in document (20) is not a conclusive proof that the heterologous beta-glucosidase genes of SEQ01-SEQ05 cannot be expressed in a *Trichoderma* microorganism.

24. Besides the scarce probative value of the experimental data in document (20), in the present case it is questionable whether the provision of examples of beta-glucosidases which cannot be expressed in *Trichoderma* may call into question the reproducibility of the

claimed invention. The board shares the opposition division's view that it does not.

25. The methods of claims 1 and 12 are based on the use of spent whole fermentation broth of a recombinant *Trichoderma* microorganism which **expresses** one or more heterologous genes encoding beta-glucosidase. The patent discloses a recombinant *Trichoderma* microorganism which expresses the heterologous beta-glucosidase of *Aspergillus oryzae*, namely *Trichoderma reesei* SMA 135-04 (see Examples 7 and 8). Incidentally, also document (20) describes a recombinant *Trichoderma* microorganism which expresses a heterologous beta-glucosidase, namely the beta-glucosidase of *Aspergillus thermomutatus* (see Reference in Figures 1 and 2). Thus, even if document (20) were considered to be persuasive evidence that at least some beta-glucosidase genes cannot be expressed in a *Trichoderma* microorganism, this would be immaterial to the ability of the skilled person to reproduce the claimed invention (see paragraphs 33 to 38 below).

26. For these reasons, the experimental data in document (20) are *prima facie* unlikely to have any impact on the board's decision on sufficiency of disclosure. Hence, document (20) and appellant's submissions relying on the experimental data provided in this document are not admitted into the appeal proceedings.

Rule 106 EPC

27. The appellant raised an objection under Rule 106 EPC at the oral proceedings. The appellant submitted that its right to be heard under Article 113(1) EPC had been violated because the opposition division as well as the

board had rejected the experimental data filed in document (20) due to its late filing without taking the relevance of the data regarding the requirements under Article 83 EPC into consideration.

28. First, the argument that the appellant's right to be heard was violated because the **opposition division** did not admit document (20) is, as such, irrelevant to an objection under Rule 106 EPC. The procedural defect within the meaning of Rule 106 EPC must relate to the procedure before the board.

29. Second, in its objection the appellant did not suggest that the board failed to hear the appellant on the issue of admittance. In fact, there is no doubt that the appellant was heard by the board on the question of the admittance of document (20). This is true for both the board's review of the opposition division's decision on not admitting the document and the board's own decision not to admit the document. The admittance of this document was discussed at the oral proceedings before the board. Furthermore, the board took into account the arguments put forward by the appellant, as can be seen by the board's findings on this issue in paragraphs 10 *et seq.* above.

30. Third, the board considered the relevance of the data for the case in hand and specifically in relation to the objection under Article 83 EPC (see above), contrary to what the appellant seems to contend in its objection.

31. In this context, the appellant said at the oral proceedings that it could not bring forward all the arguments regarding the document and the relevance of the data, since the document had not been admitted.

However, this argument is inconclusive. Since document (20) was not filed in due time, it was for the appellant to bring forward all arguments in favour of its admittance, including – if it so wishes - arguments as to the prima facie relevance of the document. For this, there is no need to first admit the document (20) into the proceedings. The appellant had the opportunity to argue in favour of its admittance and indeed made submissions to this effect, both in writing and at the oral proceedings before the board. As already mentioned, the board took into account the arguments made by the appellant and, in particular, those arguments related to the relevance of the data included in this document. Nothing further needs to be done to fulfil the requirements of Article 113(1) EPC.

32. Therefore, the board dismissed the appellant's objection at the oral proceedings.

Sufficiency of disclosure

33. The appellant contested the opposition division's finding that the patent disclosed the claimed invention in a manner sufficiently clear and complete. It contended, in particular, that "*... the skilled person has to rely on chance to find a Trichoderma microorganism to rework the method of the opposed patent ...*".

34. The board does not share this view. It is undisputed that the patent discloses a method according to claim 1 which uses spent whole fermentation broth of a recombinant *Trichoderma* microorganism expressing a heterologous gene encoding the beta-glucosidase of *Aspergillus oryzae*, namely *Trichoderma reesei* SMA 135-04 (see Examples 8 and 9). Contrary to

appellant's view, the fact that the patent discloses also a recombinant *Trichoderma* microorganism (*Trichoderma reesei* SMA 130) which does not express the heterologous beta-glucosidase gene ("*No beta-glucosidase protein was visible by SDS-PAGE...*"; see first sentence of paragraph [0263]) is not prejudicial, because claims 1 and 12 expressly require an effective amount of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism which **expresses** a heterologous gene encoding beta-glucosidase.

35. As regards appellant's argument that a person skilled in the art would not be able to obtain substantially all embodiments falling within the scope of the claims, the board shares the opposition division's view that this argument was based on a misconception of the requirements of Article 83 EPC.

36. It is uncontested that the skilled person was able to degrade or convert plant cell wall polysaccharides into one or more sugars by treating the polysaccharides with **any** spent whole fermentation broth of a recombinant *Trichoderma* microorganism which expresses one or more heterologous genes encoding beta-glucosidase. Technical information how to obtain the required recombinant *Trichoderma* microorganism is provided in the patent, and there is no persuasive evidence on file that further recombinant *Trichoderma* microorganisms as defined in claim 1 could not be obtained.

37. In the decision under appeal, the opposition division cited documents (1), (5), (7) and (10) as evidence that the skilled person could obtain such recombinant *Trichoderma* microorganisms without undue burden or inventive skills. Appellant's argument that none of these documents describes the use of spent whole

fermentation broth of a recombinant *Trichoderma* is not pertinent, as its objection of lack of sufficient disclosure concerned solely the skilled person's capability to obtain a *Trichoderma* microorganism which expresses a heterologous gene encoding a beta-glucosidase.

38. For these reasons, the board holds that the opposition division's finding on sufficiency of disclosure in the patent is correct, and that the ground for opposition of Article 100(b) EPC does not prejudice the maintenance of the patent as granted.

Article 100(a) in conjunction with Article 54 EPC

Article 87 EPC – validity of the priority

39. In the decision under appeal, the opposition division found that the priority of the US application No. 60/556,779 (document (22) in the proceedings) was validly claimed for the subject-matter of claim 1 (see section 16.1 of the decision under appeal), and that this application represented the first filing for the claimed method, because document (8), an earlier patent application by the same applicant, did not provide an unambiguous disclosure of the same subject-matter (see section 16.2 of the decision under appeal).

40. These findings have been contested by the appellant only as it concerns the validity of the priority right of the US application No. 60/556,779. The arguments put forward by the appellant to substantiate its objection were essentially the same as those provided in connection with the ground for opposition of Article 100(c) EPC.

41. Claim 9 of document (22), which is dependent from claim 1, is directed to a method for degrading or converting plant cell wall polysaccharide into a product, in which method the heterologous gene encodes a beta-glucosidase. Claim 30, which is dependent from claim 22, relates to a method for producing an organic substance, the method being characterized by the feature that the heterologous gene encodes a beta-glucosidase. On page 8, lines 13 to 15 of document (22), a *Trichoderma* strain is disclosed as the host microorganism expressing the heterologous gene. Hence, the general disclosure in document (22) is essentially identical to the disclosure in the application as filed. Also, the disclosure in the Examples 7 and 8 of either document (22) or the application as filed is essentially identical.

42. The board holds that the reasons given in paragraphs 2 to 7 above in connection with the objection of added matter apply, *mutatis mutandis*, also to the disclosure in document (22). Hence, document (22) discloses the same subject-matter and, thus, the same invention as defined in claims 1 and 12 of the patent as granted. Thus, the priority right of the US application No. 60/556,779 is validly claimed.

43. The relevant date for the assessment of novelty and inventive step is the filing date of the priority application, i.e. 25 March 2004.

Article 54 EPC – novelty

44. In the decision under appeal, novelty over documents (1), (2), (8) and (10) was acknowledged. The appellant contested only the findings relating to documents (1)

and (8), but raised an additional objection based on a new document (27).

Document (1)

45. This document describes a process for expressing enhanced extracellular beta-glucosidase in a recombinant filamentous fungus which has been transformed with an expression vector containing a fungal DNA sequence encoding enhanced beta-glucosidase (see column 4, lines 40 to 47). "Enhanced extracellular beta-glucosidase" means that at least one additional copy of a gene encoding for extracellular beta-glucosidase has been introduced into the genome (see paragraph bridging columns 5 and 6). Further, the expression of a fungal DNA sequence encoding beta-glucosidase in a recombinant filamentous fungus is disclosed in document (1) as a first step of a method of enhancing the flavour or aroma of foods, the method comprising the further steps of: (b) culturing the transformants under conditions to permit growth thereof; (c) isolating beta-glucosidase produced from said transformants; and (d) adding the beta-glucosidase to foods (see claim 1 in column 55, lines 21 to 42 of document (1)). In an embodiment of this method, the filamentous fungus is from the genus *Trichoderma* (see claim 2 in column 55, lines 43 and 44). Further applications of the isolated beta-glucosidase preparations are the degradation of products made from cellulose such as paper, cotton and cellulosic diapers (see paragraph bridging columns 17 and 18), and the production of ethanol by simultaneous saccharification and fermentation (see full paragraphs in column 18).

46. The appellant argued that document (1) implicitly disclosed the use of spent whole fermentation broth in

a method for degrading or converting plant cell wall polysaccharides into one or more sugars. The passage of document (1) on which the appellant relied, concerns the identification and isolation of transformant strains and reads:

> "*The transformants can then be isolated from the culture media and used in a variety of applications which are described below.*" (see column 16, lines 44 to 46)

47. The board is not persuaded that a person skilled in the art derives directly and unambiguously from this passage the use of spent whole fermentation broth containing both culture medium **and** cells, as the passage clearly describes that the recombinant cells are "isolated", i.e. separated from the culture medium.

48. Appellant's interpretation of the word "can" in the quoted passage as implying that the transformants do not need to be isolated and, thus, as a clear and unambiguous disclosure of the use of spent whole fermentation broth, is artificial. All applications of the method described in document (1) are based on the use of either an **isolated** enhanced beta-glucosidase preparation, or an **isolated** recombinant fungal cellulase composition lacking beta-glucosidase. As stated in column 16, lines 53 to 57 of document (1), the isolation procedure involves centrifuging the culture or fermentation medium containing the transformants and filtering by ultrafiltration the supernatant to obtain a recombinantly produced fungal cellulase composition.

49. Hence, the methods of claims 1 and 12 are novel over document (1).

Document (8)

50. In the decision under appeal, the opposition division found that document (8), which undisputedly forms part of the state of the art under Article 54(3) EPC, did not anticipate the subject-matter of claim 1.

51. Although document (8) relates primarily to methods for producing secreted polypeptides, methods for degrading or converting a cellulose-containing biomass using the produced polypeptides are envisaged. The polypeptides can be used in the form of a crude fermentation broth with or without the cells removed, or in the form of a semi-purified or purified enzyme preparation (see chapter "Degradation of Biomass" starting on page 21, line 20, in particular the passage on page 22, lines 3 to 6). On page 20, lines 9 to 11 of document (8), a cell of a species of the genus *Trichoderma* is disclosed in a list of eleven filamentous fungal host cells for the production of the polypeptides. Beta-glucosidase is found in a list of enzymes on page 11, lines 9 to 14, and the feature "heterologous" is disclosed on page 10, lines 21 and 22 as an alternative to "native".

52. Examples 1 to 6 of document (8) describe the construction of expression vectors including a sequence encoding a β-glucosidase of *A. oryzae*, and Examples 7 and 8 the expression of the beta-glucosidase in *Trichoderma reesei*. Examples 9 to 18 disclose the construction of expression vectors for *Saccharomyces cerevisiae* which include a sequence encoding a beta-glucosidase of *Aspergillus fumigatus*, and Example 19 describes the expression of the *A. fumigatus* beta-glucosidase in *S. cerevisiae*. None of the examples of document (8) describes a method for degrading or

converting plant cell wall polysaccharides into one or more sugars using spent whole fermentation broth from a recombinant *Trichoderma* microorganism which expresses a heterologous gene encoding beta-glucosidase.

53. As was found in the decision under appeal (see section 16.2.2), to arrive at the method of claim 1 of the patent as granted, a person skilled in the art reading document (8) has to select various features of the claimed method - not only the host cell and the enzyme, but also the form in which the enzyme preparation is provided - from a corresponding list of several equally preferred elements. Since there is no clear link in document (8) between the individual disclosures of those features, either in the description or in the examples, the skilled person cannot derive directly and unambiguously from document (8) a method as defined in claim 1 of the patent. The same applies with respect to the method of claim 12. Consequently, novelty over document (8) is acknowledged.

Admittance of document (27) into the proceedings

54. Together with its statement of grounds of appeal, the appellant filed a new document (27) which allegedly destroyed the novelty of the claimed subject-matter. In the board's view, the submission of this document in appeal proceedings cannot be regarded as a response to any new or unexpected issues arising either at the oral proceedings before the opposition division, or from the decision under appeal. At the oral proceedings before the board, the appellant also argued that document (27) was intended to "complement" the disclosure of document (1), i.e. to make clear that this document implicitly described the use of spent whole

fermentation broth. However, the appellant failed not only to give persuasive reasons as to why document (27) could not have been filed in opposition proceedings, but also to convince the board of the *prima facie* relevance of the content of the document for the assessment of novelty.

55. In view of the above, document (27) is not admitted into the proceedings.

Article 100(a) in conjunction with Article 56 EPC

Document (3) as the closest state of the art

56. In the decision under appeal, document (3) was regarded as the closest state of the art. This document describes a method for simultaneous saccharification and fermentation (SSF) of cellulose, in which cellulase enzyme is used to saccharify cellulose to glucose which is simultaneously converted to ethanol by yeast. In the experiments described in document (3), cellulase enzyme produced by the *Trichoderma reesei* mutant L27 was added to the cellulose substrate, either as culture filtrate or as whole culture broth including the fungal mycelia. The aim of the experiments was to test the possible contribution of mycelia-bound beta-glucosidase to the SSF performance with "modern fungal cellulase producers" (see Abstract), as it had been described in the scientific literature that "*... as much as 50% of the β-glucosidase activity and 7% of the endoglucanase activity remains bound to the cells of T. reesei QM 9414*" (see page 288, lines 15 to 17).

57. It is stated in document (3) that, even though there were significant differences in yields between the different cellulase batches due the little

reproducibility between batches and daily changes in enzyme composition, the ethanol yields obtained using whole broth were higher than those with the filtrate, most of the increase being associated with using the mycelia (see Table 2 on page 295 and the paragraph bridging pages 295 and 296).

58. In the decision under appeal, the opposition division found that the method of claim 1 of the present patent differed from the method described in document (3) in the use of a recombinant *Trichoderma* microorganism which expresses one or more heterologous genes encoding β-glucosidase.

59. This finding was contested by the appellant. Referring to the last sentence in paragraph [0027] of the patent ("*It will be understood in the present invention that a gene native to the host that has undergone manipulation, as described herein, will be considered a heterologous gene*"), the appellant argued that, since the method of document (3) used spent whole fermentation broth containing a **mutated** *T. reesei* strain which expresses beta-glucosidase, the sole difference between the method of claim 1 and that of document (3) was that the latter does not use a **recombinant** *T. reesei*.

60. The board disagrees. Document (3) describes the *T. reesei* L27 strain as an "advanced" mutant of *T. reesei*. However, it does not specify which genes are mutated in this strain, let alone discloses or suggests that the mutation/s is/are in a beta-glucosidase gene. Hence, contrary to appellant's view, the *T. reesei* L27 strain used in the method of document (3) cannot be regarded as a *Trichoderma* microorganism which expresses

one or more **heterologous** genes encoding a beta-glucosidase.

Technical effect and problem to be solved

61. In the decision under appeal, the opposition division held that the technical effect associated with the use of a recombinant *Trichoderma* microorganism expressing one or more heterologous genes encoding beta-glucosidase might vary depending on the characteristics of the specific recombinant *Trichoderma* microorganism used, i.e. using some recombinant microorganisms an improvement in the degradation or conversion of plant cell wall polysaccharides may be observed, while in others it may not. Thus, the problem to be solved starting from document (3) was formulated as the provision of an alternative method for degrading or converting plant cell wall polysaccharides (see section 21.2 of the decision).

62. The appellant questioned whether the claimed invention is associated with any technical effect, and disputed that the invention may provide an alternative method for degrading or converting plant cell wall polysaccharides. However, appellant's arguments fail to persuade the board.

63. As is apparent from a comparison between, respectively, Figures 12 and 15 (*T. reesei* RutC30 preparations) and Figures 14 and 13 (*T. reesei* SMA 135-04 preparations) of the patent, the reducing sugars (RS) and glucose yields resulting from the enzymatic hydrolysis of pre-treated corn stover (PCS) by spent whole fermentation broth of the recombinant *T. reesei* SMA 135-04 strain are at least comparable to those obtained using spent whole fermentation broth of the unmodified parent

strain *T. reesei* RutC30. In the light of the experimental results provided in the patent, the board has no reason to doubt that the exemplified method using spent whole fermentation broth of the recombinant *T. reesei* SMA 135-04 strain achieves the technical effect of degrading or converting plant cell wall polysaccharides into one or more sugars, and thus represents an alternative to the method of document (3).

64. There is no evidence on file which gives rise to any doubt that a method as defined in claim 1 is associated with the same technical effect as the exemplified method using the recombinant *T. reesei* SMA 135-04 strain. Contrary to appellant's view, the fact that the *T. reesei* SMA 130 strain described in the examples of the patent does **not** express a heterologous gene encoding a beta-glucosidase (see paragraph [0263], first sentence) is not prejudicial, because a method using such a strain does not fall under the scope of claim 1.

65. The appellant further disputed that the problem formulated by the opposition division is solved over the whole scope of claims 1 and 12. There is however no evidence on file showing that the method defined in claim 1 which uses an effective amount of a spent whole fermentation broth of a recombinant *Trichoderma* microorganism **expressing** a heterologous beta-glucosidase gene to treat plant cell wall polysaccharides, does not provide a level of degradation or conversion of plant cell wall polysaccharides that is, under the same experimental conditions, at least comparable to that achieved by a method using a *Trichoderma* microorganism which does **not** express a heterologous beta-glucosidase gene, as the

method described in document (3). It should be kept in mind that the technical problem in the present case is not the provision of an improved method, but of an **alternative** method, and that for an inventive step to be present, it is not necessary to show improvement over the state of the art (see decision T 1791/08 of 11 March 2010, point 12.5 of the Reasons).

Obviousness over document (3) alone

66. The sole remaining question is whether it was obvious to a skilled person to modify the method of document (3) by replacing the *T. reesei* L27 strain with a recombinant *Trichoderma* strain expressing one or more heterologous genes encoding beta-glucosidase.

67. The appellant argued that the method of claim 1 was obvious in view of document (3) alone, and pointed in particular to the passage on page 288, lines 6 to 10 of this document. In this passage the authors of document (3) refer to a scientific publication reporting that the best SSF performance is produced by commercial cellulase batches with the highest beta-glucosidase content, and that the performance of every batch is enhanced by the addition of beta-glucosidase.

68. It is undisputed that a person skilled in the art derives from this passage that a high beta-glucosidase content may improve the performance of a cellulase enzyme preparation in a method for degrading or converting plant cell wall polysaccharides into ethanol. However, the passage to which the appellant pointed does not suggest to the skilled person the use of a recombinant *Trichoderma* microorganism expressing a beta-glucosidase gene, but the addition of beta-glucosidase **enzyme** to the cellulase preparation.

69. The appellant also pointed to a passage on page 296, last paragraph under the heading "Discussion", in which the results obtained using spent whole fermentation broth are discussed. The authors state that:

> "*... the use of a different organism may result in better performance of the broth if the organism retains more β-glucosidase in the cell. It would be valuable to examine enzyme location in a variety of different cellulase-producing organisms and ultimately to determine their performance with SSF.*"

In the board's view, this passage suggests the use of spent whole fermentation broth of a different cellulase-producing organism which retains more beta-glucosidase in the cell, but does not give any hint towards the use of spent whole fermentation broth of a recombinant *Trichoderma* strain expressing a heterologous beta-glucosidase gene.

70. The appellant took the view that the passage on page 288, first sentence of the second full paragraph of document (3) provided an incentive to use heterologous genes encoding a beta-glucosidase. The passage reads:

> "*Over the past years, many mutants have been developed to improve the release of β-glucosidase into the culture broth, and some questions have existed about the advantages of using whole cell broth in SSF.*"

71. The board does not share appellant's view. The mutant strains referred to in the passage quoted above were

obtained by random mutagenesis and selected for increased **secretion** of beta-glucosidase enzyme into the culture medium, since the state of the art at the publication date of document (3) was to prepare cellulase enzymes from the culture filtrate, i.e. the culture medium without the cells of the producer microorganism. For a person skilled in the art seeking to provide an alternative method for degrading or converting plant cell wall polysaccharides, a combination of the teachings in the passages of document (3) quoted in paragraphs 69 and 70 above might provide an incentive to use spent whole fermentation broth of a *T. reesei* **mutant** that **retains** more beta-glucosidase in the cell. However, the skilled person does not find in document (3) any incentive to use a spent whole fermentation broth of a **recombinant** *Trichoderma* strain, let alone a recombinant strain which **expresses a heterologous gene encoding beta-glucosidase**, as claim 1 requires.

72. Hence, having regard to the teachings of document (3) alone, the method of claim 1 is not obvious. The same applies to the method of claim 12 which requires in step (a) the use of spent whole fermentation broth of a recombinant *Trichoderma* microorganism defined in the same manner as in claim 1.

Obviousness over a combination of documents (3) and (1)

73. The appellant further alleged that the opposition division had failed to assess properly the technical knowledge of the skilled person at the relevant date, as shown by documents describing methods for producing enzymes that use recombinant *Trichoderma* microorganisms expressing a heterologous gene (see documents (5), (15), (16) and (18)), in particular a gene encoding

beta-glucosidase (see documents (1), (7) and (10)). In particular, the appellant relied on a combination of the teachings of documents (3) and (1).

74. There is however no recognisable pointer in document (3) which would have prompted the skilled person to combine the use of a spent whole fermentation broth as described in this document, with a recombinant strain which expresses a heterologous gene encoding beta-glucosidase as described in documents (1), (7) or (10). Like the opposition division, the board considers that these technical measures represent two independent, parallel approaches to the saccharification of cellulosic material. While it may have been theoretically possible and technically feasible to combine the two approaches, the board is not persuaded that, in the absence of a clear hint, the skilled person would have made such a combination. Technical feasibility is a necessary requirement for sufficiency of disclosure but it is not sufficient to render obvious the claimed subject-matter.

75. Contrary to appellant's view, the fact that recombinant *Trichoderma* microorganisms expressing a heterologous gene (see documents (5), (15), (16) and (18)), in particular a gene encoding a beta-glucosidase (see documents (1), (7) and (10)) were known in the art at the relevant date, does not necessarily render the claimed subject-matter obvious to a skilled person. As stated in decision T 1014/07 of 2 July 2012 (see point 12 of the Reasons), the decisive question is *"... whether or not the skilled person would have combined the known teachings such as to arrive at the claimed subject-matter when attempting to solve the underlying technical problem.* [...] *the combination of known teachings may result in non-obvious subject-*

matter, namely when the skilled person is not motivated, for example by promptings in the prior art, to make such a combination. Under these circumstances the presence of any special effect arising from the combination is not necessary to establish an inventive step."

76. Document (3) does not provide any motivation to combine the teachings therein with those of document (1), but rather suggests that a different microorganism which retains more beta-glucosidase in the cell is used, thus prompting the skilled person in a different direction. In the board's view, only the knowledge of the claimed invention could have motivated the skilled person to combine the teachings of documents (3) and (1). Hence, the objection of lack of inventive step based on a combination of documents (3) and (1) fails.

Document (1) as the closest state of the art

77. The appellant sought to support the objection of lack of inventive step on a combination of the teachings of document (1) as the closest state of the art with those of document (4) or document (5).

78. As was found in connection with the assessment of novelty (see paragraphs 45 to 49 above), document (1) does not describe a method for degrading or converting plant cell wall polysaccharides which employs spent whole fermentation broth, because only isolated cellulase preparations, i.e. preparations obtained by centrifugation and ultrafiltration, are envisaged.

79. The technical effect associated with the use of spent whole fermentation broth is that the method becomes simpler and more cost-efficient because a

centrifugation or ultrafiltration step is not required. This has not been disputed by the appellant. Hence, starting from document (1) the problem to be solved is the provision of an improved method for degrading or converting plant cell wall polysaccharides into one or more sugars.

80. The board does not share appellant's view that a skilled person found in document (1) an incentive to use spent whole fermentation broth instead of culture filtrate. In the passage on column 3, lines 32 and 33 on which the appellant relied, it is stated that a major part of the detectable beta-glucosidase activity remains bound to the cell wall of *Trichoderma reesei*. To overcome the ensuing problem of beta-glucosidase being rate-limiting in the degradation of cellulose using cellulase enzyme isolated from the culture broth of filamentous fungi, document (1) mentions three different approaches taken in the art:
(i) supplementation with beta-glucosidase enzyme,
(ii) altered culturing conditions and (iii) mutant strains with enhanced beta-glucosidase production (see column 3, lines 44 to 60). None of these approaches involves the use of spent whole fermentation broth.

81. As a further approach, document (1) describes the use of a recombinant fungal strain with increased levels of expression of the *T. reesei* beta-glucosidase gene to produce cellulase preparations with enhanced beta-glucosidase activity. Like the earlier approaches mentioned in document (1), this approach is based on a cellulase preparation which is **isolated** from the culture broth and does not contain fungal cells. This is derivable from the statements in column 16, lines 53 to 57 of document (1), and is also implicit in the consistent characterization of the produced beta-

glucosidase as an **extracellular** beta-glucosidase (see, e.g., "*... the present invention relates to Trichoderma reesei strains that have increased* [...] *levels of expression of the bgl1 gene resulting in enhanced* [...] ***extracellular*** *β-glucosidase protein levels ...*" in column 1, lines 21 to 24 under the heading "Field of the Invention"; emphasis added by the board).

82. Hence, contrary to appellant's view nothing in document (1) would prompt the skilled person towards the use of spent whole fermentation broth and a combination of the teachings of this document with those of document (4) or document (5).

83. Document (4) was published in 1977 and describes a method for producing ethanol by simultaneous saccharification and fermentation (SSF) of cellulosic materials. The method uses a commercially available cellulase ("Pancellase") as well as four different cellulase preparations derived from *Trichoderma viridae*, in particular: (i) a partially purified enzyme solution prepared from culture filtrate, (ii) culture broth of a submerged culture, (iii) "*Koji*", i.e. *T. viridae* mycelium grown on solid medium, and (iv) *Koji* extract prepared by extraction of *Koji* with deionized water followed by centrifugation (see section under the heading "Cellulases" starting on page 553). Among the five cellulase preparations used in the experiments described in document (4), only the culture broth of a *T. viridae* submerged culture could be regarded as a "spent whole fermentation broth" (see definition in the last two sentences of paragraph [0159] of the patent), while the *Koji* preparation contains cellular biomass but lacks the culture medium, and in the other two preparations the

cellular biomass is removed by filtration (see first sentence of the last full paragraph on page 553).

84. In its submissions both in opposition and appeal proceedings, the appellant did not indicate what would have motivated the skilled person to combine the teachings of document (1) with a particular teaching in document (4), a document which had been published 27 years before the relevant date for the assessment of inventive step. It should be noted that, for an objection of lack of inventive step to succeed, it is not sufficient to argue that a person skilled in the art could arrive at the claimed subject-matter by combining the teachings of two documents. Rather, it is necessary to identify conclusive reasons on the basis of tangible evidence that would have prompted the skilled person to make a particular modification (see decision T 1014/07 of 2 July 2012, point 8 of the Reasons, and decision T 1255/13 of 2 July 2019, point 1.5.1 of the Reasons). The appellant failed to identify such reasons.

85. Document (5) describes enzyme preparations which are enriched in hemicellulose-, pectin- and/or lignin-degrading enzymes, but are partially or completely deficient in cellulase degrading activity. An "enzyme preparation" is defined in document (5) as a composition containing enzymes which have been **extracted** (i.e. either partially or completely purified) from fungi. The term "enzyme preparation" is meant to include a composition comprising **medium** used to culture such fungi and any enzymes which the fungi have secreted into such medium during the culture (see paragraph bridging pages 5 and 6). There is neither a suggestion nor a clear teaching in document (5) to use spent whole fermentation broth.

86. In view of the above, the board concludes that the skilled person had no reason to turn to either document (4) or (5), nor to combine their teachings with those of document (1). The skilled person would therefore not have arrived at the method of claim 1 in an obvious manner. The same applies as regards the method of claim 12.

Admittance of new lines of attack and documents (29) and (30)

87. Together with the statement setting out the grounds of appeal the appellant submitted for the first time several new documents, in particular documents (29) and (30) which were allegedly relevant to the assessment of inventive step. The appellant did not put forward any persuasive reasons as to why these documents could not have been filed in opposition proceedings. Nor did the appellant explain why these documents are more relevant than documents already on file, in particular documents (3) and (1). Therefore, the board decides not to admit documents (29) and (30) into the proceedings (Article 12(4) RPBA 2007).

88. Moreover, in its statement the appellant put forward a line of attack against dependent claims 9 to 14, 20 and 21 based on various combinations of documents already on file or submitted for the first time with the statement. The combinations of documents had never been discussed in opposition proceedings, let alone in connection with those particular claims. For that reason, the board decides not to admit the new lines of attack into the proceedings.

Conclusion

89. None of the grounds for opposition under Article 100 EPC prejudices the maintenance of the patent as granted.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: On behalf of the Chairman (according to Art.8(3) RPBA 2020):

L. Malécot-Grob M. R. Vega Laso

Decision electronically authenticated