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- (71) **Applicant:** NOVOZYMES A/S [DK/DK]; Krogshoejvej 36, DK-2880 Bagsvaerd (DK).
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- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- with sequence listing part of description (Rule 5.2(a))

- (88) **Date of publication of the international search report:**  
31 December 2014



WO 2014/177541 A3

(54) **Title:** GLUCOAMYLASE VARIANTS AND POLYNUCLEOTIDES ENCODING SAME

(57) **Abstract:** The present invention relates to glucoamylase variants. The present invention also relates to polynucleotides encoding the variants; nucleic acid constructs, vectors, and host cells comprising the polynucleotides; and methods of using the variants.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2014/058686

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-15(partially)

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2014/058686

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C12N9/26 C11D3/386  
ADD.  
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED  
Minimum documentation searched (classification system followed by classification symbols)  
C12N C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/068803 A1 (NOVOZYMES AS [DK]; NOVOZYMES NORTH AMERICA INC [US]; LANDVIK SARA [DK]) 9 June 2011 (2011-06-09) claims 1-21; sequence 16 -----	1-15

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search  
24 July 2014

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11/11/2014

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Stoyanov, Borislav

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/058686

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011068803	A1	09-06-2011	
		AU 2010276471 A1	03-05-2012
		CA 2782036 A1	09-06-2011
		EP 2507371 A1	10-10-2012
		US 2012214196 A1	23-08-2012
		US 2013267002 A1	10-10-2013
		WO 2011068803 A1	09-06-2011
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 45 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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2. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 46 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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3. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 61 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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4. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 86 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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5. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 119 of the

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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## 6. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 120 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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## 7. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 318 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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## 8. claims: 1-15(partially)

A glucoamylase variant comprising a substitution at one or more positions corresponding to positions 348 of the polypeptide of SEQ ID NO: 3 wherein the variant has glucoamylase activity and wherein the variant has at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99%, but less than 100% sequence identity to the polypeptide of SEQ ID NO: 3 and the uses thereof.

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