



- (51) **International Patent Classification:**  
*C12P 19/14* (2006.01) *C12N 9/42* (2006.01)
- (21) **International Application Number:**  
PCT/US2013/070116
- (22) **International Filing Date:**  
14 November 2013 (14.11.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
61/726,712 15 November 2012 (15.11.2012) US
- (71) **Applicant (for all designated States except US):** **BP CORPORATION NORTH AMERICA INC.** [US/US]; 501 Westlake Park Boulevard, Houston, Texas 77079 (US).
- (72) **Inventors; and**
- (71) **Applicants (for US only):** **LYON, Christopher Scott** [US/US]; 150 W. Warrenville Road, Mail Code 200-1W, Naperville, Illinois 60563 (US). **LUGINBUHL, Peter** [US/US]; 150 W. Warrenville Road, Mail Code 200-1W, Naperville, Illinois 60563 (US). **STEGE, Justin Trent** [US/US]; 150 W. Warrenville Road, Mail Code 200-1W, Naperville, Illinois 60563 (US).
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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.

- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**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))

- (88) **Date of publication of the international search report:**  
17 July 2014



WO 2014/078546 A3

(54) **Title:** VARIANT CBH II POLYPEPTIDES WITH IMPROVED SPECIFIC ACTIVITY

(57) **Abstract:** The present disclosure relates to variant CBH II polypeptides that have improved specific activity, and compositions, e.g., cellulase compositions, comprising variant CBH II polypeptides. The variant CBH II polypeptides and related compositions can be used in variety of agricultural and industrial applications. The present disclosure further relates to nucleic acids encoding variant CBH II polypeptides and host cells that recombinantly express the variant CBH II polypeptides.

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2013/070116

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. C12P19/14 C12N9/42  
 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)  
 C12P C12N C07K  
 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, Sequence Search, BIOSIS, CHEM ABS Data, EMBASE

<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/141779 A1 (DANISCO US INC [US]; AEHLE WOLFGANG [US]; BOTT RICHARD R [US]; BOWER B) 9 December 2010 (2010-12-09) pages 62-118; example 3; table 3 -----	1,6-77
A	US 2009/186381 A1 (LAVIGNE JAMES A [CA] ET AL) 23 July 2009 (2009-07-23) sequences 22, 78-82 -----	1,6-77
Y	WO 97/44361 A1 (RECOMBINANT BIOCATALYSIS INC [US]; LAM DAVID E [US]; MATHUR ERIC J [US]) 27 November 1997 (1997-11-27) figure 1E -----	5
Y	WO 2006/074005 A2 (GENENCOR INT [US]; AEHLE WOLFGANG [US]; CALDWELL ROBERT M [US]; DANKME) 13 July 2006 (2006-07-13) sequence 92 -----	5
	-/--	

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  4 February 2014	Date of mailing of the international search report  12/05/2014
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Petri, Bernhard

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/070116

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2010/118058 A2 (CALIFORNIA INST OF TECHN [US]; ARNOLD FRANCES H [US]; HEINZELMAN PETE) 14 October 2010 (2010-10-14) sequence 85	5
Y	----- DATABASE Geneseq [Online]  22 January 2009 (2009-01-22), "Lignocellulosic enzyme sequence, SEQ ID 282.", XP002719651, retrieved from EBI accession no. GSP:ASR93979 Database accession no. ASR93979 sequence	5
A	----- LANTZ SUZANNE E ET AL: "Hypocrea jecorina CEL6A protein engineering", BIOTECHNOLOGY FOR BIOFUELS, BIOMED CENTRAL LTD, GB, vol. 3, no. 1, 8 September 2010 (2010-09-08), page 20, XP021082868, ISSN: 1754-6834, DOI: 10.1186/1754-6834-3-20 page 5, right-hand column, paragraph 2 - page 8, left-hand column, paragraph 2 -----	1,5-77

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/070116

## Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:
  - a. (means)
    - on paper
    - in electronic form
  - b. (time)
    - in the international application as filed
    - together with the international application in electronic form
    - subsequently to this Authority for the purpose of search
2.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
3. Additional comments:

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/070116

## 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, 5(completely); 6-77(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

Information on patent family members

International application No

PCT/US2013/070116

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2010141779	A1	09-12-2010	AU 2010256519 A1	24-11-2011
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			RU 2011137003 A	20-05-2013
			US 2010255542 A1	07-10-2010
			WO 2010118058 A2	14-10-2010

**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, 5(completely); 6-77(partially)

Polypeptide comprising a variant CBH II catalytic domain

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2. claims: 2(completely); 6-77(partially)

Polypeptide comprising a variant CBH II cellulose binding domain

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3. claims: 3(completely); 6-77(partially)

Polypeptide comprising a variant CBH II SS-linker

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4. claims: 4(completely); 6-77(partially)

Polypeptide comprising a variant CBH II CBD-CD linker

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