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61/657,075 8 June 2012 (08.06.2012) US
- (71) **Applicants:** DSM IP ASSETS B.V. [NL/NL]; Het Overloon 1, NL-6411 TE Heerlen (NL). CONCORDIA UNIVERSITY [CA/CA]; 1455 de Maisonneuve Boulevard West, Suite GM 1000, Montréal, Québec H3G 1M8 (CA).
- (72) **Inventors:** TSANG, Adrian; 3816 Draper Ave., Montréal, Québec H4A2P1 (CA). POWLOWSKI, Justin; 4555 Montclair Ave., Montréal, Québec H4B2J8 (CA). BUTLER, Gregory; 1700 René Lévesque Blvd. W., Suite 301, Montréal, Québec H3H2V1 (CA).
- (74) **Agent:** MATULEWICZ, Emil, Rudolf, Antonius; DSM Intellectual Property, P.O. Box 130, NL-6100 AC Echt (NL).
- (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, 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, 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))
- with (an) indication(s) in relation to deposited biological material furnished under Rule 13bis separately from the description (Rules 13bis.4(d)(i) and 48.2(a)(viii))
- with sequence listing part of description (Rule 5.2(a))

- (88) **Date of publication of the international search report:**
30 January 2014

(54) **Title:** NOVEL CELL WALL DECONSTRUCTION ENZYMES OF MYRIOCOCCUM THERMOPHILUM AND USES THEREOF

(57) **Abstract:** The present invention relates to a process for degrading biomass or pretreated biomass wherein an enzyme is used comprising a polypeptide having a. a polypeptide sequence as set forth in any one of SEQ ID Nos: 3, 6, 9, 12, 15, 8, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 59, 61, 63, 65, 67, 69 and 71; b. a polypeptide that is at least 60%, preferably at least 70%, more preferably at least 80%, even more preferably at least 90%, 95%, 96%, 97%, 98% or 99% homologous to the any one of SEQ ID Nos: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 59, 61, 63, 65, 67, 69 and 71; c. a polypeptide sequence encoded by nucleic acids sequence as set forth in any one of SEQ ID NOS: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43, 44, 46, 47, 49, 50, 52, 53, 56, 58, 60, 62, 64, 66, 68 and 70, or nucleic acids that are at least 60%, preferably at least 70%, more preferably at least 80%, even more preferably at least 90%, 95%, 96%, 97%, 98% or 99% homologous to any one of SEQ ID NOS: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43, 44, 46, 47, 49, 50, 52, 53, 56, 58, 60, 62, 64, 66, 68 and 70; d. a polypeptide sequence encoded by a nucleic acids sequence hybridizing under stringent conditions to the polynucleotide as set forth in any one of 2 SEQ ID NOS: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43, 44, 46, 47, 49, 50, 52, 53, 55, 56, 58, 60, 62, 64, 66, 68 and 70; or e. a polypeptide sequence encoded by a nucleic acids sequence hybridizing under stringent conditions to the reverse complement of a polynucleotide as set forth in any one of SEQ ID NOS: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43, 44, 46, 47, 49, 50, 52, 53, 56, 58, 60, 62, 64, 66, 68 and 70.



INTERNATIONAL SEARCH REPORT

International application No.

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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

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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.:

1-8(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/EP2013/061767

A. CLASSIFICATION OF SUBJECT MATTER

INV. C12N9/24 C12P19/14
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 C12P

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, BIOSIS, EMBASE, Sequence Search

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/027374 A2 (DYADIC INTERNAT USA INC [US]; VISSER JOHANNES [NL]; HINZ SANDRA [NL];) 1 March 2012 (2012-03-01) paragraph [0017] - paragraph [0307]; claims 1-89; sequences 297, 298 -----	1-8
X	RANDY M BERKA ET AL: "Comparative genomic analysis of the thermophilic biomass-degrading fungi Myceliophthora thermophila and Thielavia terrestris", NATURE BIOTECHNOLOGY, vol. 29, no. 10, 1 January 2011 (2011-01-01), pages 922-927, XP055034838, ISSN: 1087-0156, DOI: 10.1038/nbt.1976 the whole document -/--	1-8



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

10 September 2013

Date of mailing of the international search report

10/12/2013

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

Westphal-Daniel, K

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/061767

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	& DATABASE UniProt [Online] 16 November 2011 (2011-11-16), "SubName: Full=Glycoside hydrolase family 3 protein; EC=3.2.1.37;", retrieved from EBI accession no. UNIPROT:G2QKP9 Database accession no. G2QKP9 sequence -----	
A	JOOST VAN DEN BRINK ET AL: "Fungal enzyme sets for plant polysaccharide degradation", APPLIED MICROBIOLOGY AND BIOTECHNOLOGY, SPRINGER, BERLIN, DE, vol. 91, no. 6, 23 July 2011 (2011-07-23), pages 1477-1492, XP019943599, ISSN: 1432-0614, DOI: 10.1007/S00253-011-3473-2 the whole document -----	1-8
A	IVA JOVANOVIC ET AL: "Fungal glycoside hydrolases for saccharification of lignocellulose: outlook for new discoveries fueled by genomics and functional studies", CELLULOSE, KLUWER ACADEMIC PUBLISHERS (DORDRECHT), NL, vol. 16, no. 4, 17 June 2009 (2009-06-17), pages 687-697, XP019728356, ISSN: 1572-882X, DOI: 10.1007/S10570-009-9307-Z the whole document -----	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/061767

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012027374 A2	01-03-2012	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-8(partially)

A process for degrading biomass or pretreated biomass wherein an enzyme is used comprising a polypeptide having a polypeptide sequence as set forth in SEQ ID NO: 3 or being at least 60% homologous to SEQ ID NO: 3 or being encoded by a nucleic acid sequence set forth in SEQ ID Nos: 1 or 2 or being at least 60% homologous to SEQ ID Nos: 1 or 2 or hybridizing under stringent conditions to the polynucleotide as set forth in SEQ ID Nos: 1 or 2 or hybridizing under stringent conditions to the reverse complement of a polynucleotide as set forth in SEQ ID Nos: 1 or 2.

2-26. claims: 1-8(partially)

As invention 1, wherein the polypeptide sequence and polynucleotide sequence are set forth in SEQ ID Nos: 4-6 (invention 2), 7-9 (invention 3), 10-12 (invention 4), 13-15 (invention 5), 16-18 (invention 6), 19-21 (invention 7), 22-24 (invention 8), 25-27 (invention 9), 28-30 (invention 10), 31-33 (invention 11), 34-36 (invention 12), 37-39 (invention 13), 40-42 (invention 14), 43-45 (invention 15), 46-48 (invention 16), 49-51 (invention 17), 52-54 (invention 18), 55-57 (invention 19), 58 and 59 (invention 20), 60 and 61 (invention 21), 62 and 63 (invention 22), 64 and 65 (invention 23), 66 and 67 (invention 24), 68 and 69 (invention 25), 70 and 71 (invention 26).
