

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 February 2009 (05.02.2009)

PCT

(10) International Publication Number
WO 2009/018537 A3

(51) International Patent Classification:
C12N 9/42 (2006.01)

(21) International Application Number:
PCT/US2008/071982

(22) International Filing Date: 1 August 2008 (01.08.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/833,133 2 August 2007 (02.08.2007) 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, BR, BW, BY, BZ, CA, CH, 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, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: NOVEL FUNGAL ENZYMES

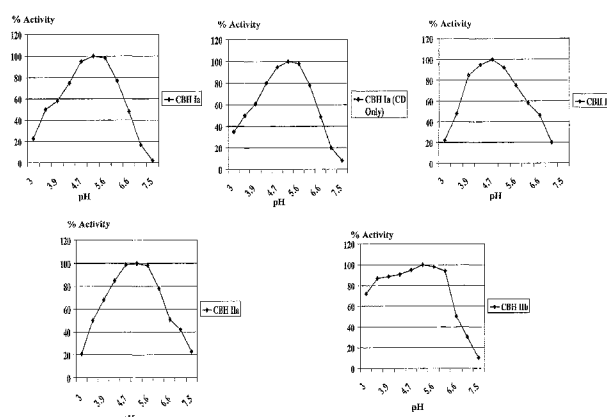


Figure 2

(57) Abstract: This invention relates to novel enzymes and novel methods for producing the same. More specifically this invention relates to a variety of fungal enzymes. Nucleic acid molecules encoding such enzymes, compositions, recombinant and genetically modified host cells, and methods of use are described. The invention also relates to a method to convert lignocellulosic biomass to fermentable sugars with enzymes that degrade the lignocellulosic material and novel combinations of enzymes, including those that provide a synergistic release of sugars from plant biomass. The invention also relates to methods to use the novel enzymes and compositions of such enzymes in a variety of other processes, including washing of clothing, detergent processes, deinking and biobleaching of paper and pulp, and treatment of waste streams.

WO 2009/018537 A3

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*
- *with sequence listing part of description published separately in electronic form and available upon request from the International Bureau*

(88) Date of publication of the international search report:
30 April 2009

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/71982

| A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C12N 9/42 (2009.01) USPC - 435/209 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) USPC: 435/209 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 435/69, 1200, 274, 277, 278, 440, 468; 800/278, 284 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Electronic Databases Searched: pubWEST, USPTO, Google, Answers.com, Google Patents Search Terms Used: recombinant, transfection, expression, control, vector, detergent, surfactant, lignocellulose, filamentous, fungus, bacteria, plant, insecticide, allergies, asthma, chrysosporium, thielava, neurospora, aureobasidium | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X ----- Y ----- A | US 2006/0218671 A1 (BROWN et al.) 28 September 2006 (28.09.2006) para [0007], [0010]-[0013], [0019]-[0021], [0028], [0031], [0034]-[0035], [0050]-[0052], [0054]-[0056], [0058], [0076], [0086], [0088], [0099]-[0102], [0113], [0115], [0124]-[0125], [0127], [0138], [0143], [0145], [0147], [0151], [0162], [0181], [0188]-[0189], [0205], [0225]-[0226] and [0230]-[0234]; See SEQ ID NO: 1-2 | 1, 8, 24, 27, 29-39, 41-50, 55, 58-60, 85-86, 113, 116, 118, 120, 122, 124 and 126 ----- 23, 26, 28, 40, 56-57, 61-63 ----- 2-7, and 67-69 |
| Y --- A | US 2006/0053514 A1 (WU et al.) 09 March 2006 (09.03.2006) para [0184] and [0198] SEQ ID NO: 3 | 23 --- 7 |
| Y | US 2007/0077630 A1 (HARRIS et al.) 05 April 2007 (05.04.2007) para [0071] and [0118] | 26, 57 and 61-63 |
| Y | US 2006/0134747 A1 (BALDWIN et al.) 22 June 2006 (22.06.2006) para [0143] and [0234] | 28 and 40 |
| Y | US 2004/0002136 A1 (EMALFARB et al.) 01 January 2004 (01.01.2004) para [0043] and [0045]; SEQ ID. NO: 15 | 56 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> | | |
| * 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 18 February 2009 (18.02.2009) | | Date of mailing of the international search report 05 MAR 2009 |
| Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201 | | Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774 |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/71982

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.: 51-54, 64-66, 73-84, 87-112, 114, 115, 117, 119, 121, 123, 125, and 127
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:

Groups I+: Claims 1-8, 23-24, 26-50, 55-63, 67-69, 85, 86, 113, 116, 118, 120, 122, 124 and 126 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 11 and nucleic acid SEQ ID NOS: 10 and 12 will be searched without an additional search fee and where claim 56 is limited to SEQ ID NO 8 and where claim 67 is limited to SEQ ID NOS: 11, 14, and 26 and where claim 69 is limited to SEQ ID NO: 47.

Groups II+: Claims 1-7, 9, 23-24, 26-50, 55-63, 67-72, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 94 will be searched and where claim 56 is limited to SEQ ID NO 8 and where claim 67 is limited to SEQ ID NOS: 11, 94, and 26 and where claims 69 and 72 are limited to SEQ ID NO: 47. Applicant may have additional sequences searched upon paying additional search fee(s).

--See Continuation--

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 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, 23-24, 26-50, 55-63, 67-69, 85, 86, 113, 116, 118, 120, 122, 124, and 126 directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 11 and nucleic acid SEQ ID NOS: 10 and 12 will be searched without an additional search fee and where claim 56 is limited to SEQ ID NO 8 ---See Continuation---

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/US 08/71982

Continuation of Box III

and where claim 67 is limited to SEQ ID NOS: 11, 14, and 26 and where claim 69 is limited to SEQ ID NO: 47.
Applicant may have additional sequences searched upon paying additional search fee(s).

Groups III+: Claims 1-7, 10, 23-24, 26-50, 55-63, 67-72, 85, 86, 113, 116, 118, 120, 122, 124, 126, 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 29 and nucleic acid SEQ ID NOS: 28 and 30 will be searched and where claim 56 is limited to SEQ ID NO 8 and where claim 67 is limited to SEQ ID NOS: 8, 14, and 29 and where claims 69 and 72 are limited to SEQ ID NO: 47. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups IV+: Claims 1-7, 11, 23-24, 26-50, 55-63, 70-72, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 44 and nucleic acid SEQ ID NOS: 43 and 45 will be searched and where claim 56 is limited to SEQ ID NO 8 and where claim 72 is limited SEQ ID NO: 47. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups V+: Claims 1-7, 12, 13, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 50 and nucleic acid SEQ ID NOS: 49 and 51 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups VI+: Claims 1-7, 12, 14, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 53 and nucleic acid SEQ ID NOS: 52 and 54 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups VII+: Claims 1-7, 15, 25, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 56 and nucleic acid SEQ ID NOS: 55 and 57 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups VIII+: Claims 1-7, 12, 16, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 62 and nucleic acid SEQ ID NOS: 61 and 63 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups IX+: Claims 1-7, 12, 17, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 65 and nucleic acid SEQ ID NOS: 64 and 66 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups X+: Claims 1-7, 12, 18, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 74 and nucleic acid SEQ ID NOS: 73 and 76 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups XI+: Claims 1-7, 12, 19, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 86 and nucleic acid SEQ ID NOS: 85 and 87 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups XII+: Claims 1-7, 12, 20, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 89 and nucleic acid SEQ ID NOS: 88 and 90 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups XIII+: Claims 1-7, 12, 21, 23-24, 26-50, 55-63, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 92 and nucleic acid SEQ ID NOS: 91 and 93 will be searched and where claim 56 is limited to SEQ ID NO 8. Applicant may have additional sequences searched upon paying additional search fee(s).

Groups XIV+: Claims 22-24, 26-50, 55-63, 67-72, 85, 86, 113, 116, 118, 120, 122, 124, 126, and 128-132 are directed to a nucleic acid, a protein encoded thereby, or compositions or methods of use thereof, where peptide SEQ ID NO: 2 and nucleic acid SEQ ID NOS: 1 and 3 will be searched and where claim 56 is limited to SEQ ID NO 8 and where claim 67 is limited to SEQ ID NOS: 2, 14, and 26 and where claims 69 and 72 are limited to SEQ ID NO: 47. Applicant may have additional sequences searched upon paying additional search fee.

The groups listed above do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2, they lack the same or corresponding special technical features because they are directed to different nucleic acids and proteins encoded thereby having distinct sequences and differing in structure and function. Furthermore, the sequences of the listed groups cannot be said to share an inventive feature over the prior art because US 6573086 B1 (Emalfarb et al.) teaches a peptide comprising SEQ ID NO: 8 (Emalfarb et al.; SEQ ID NO: 15). Accordingly, unity of invention is lacking under PCT Rule 13.1.

Continuation of item 4 of first sheet (unsearchable claims):

Claims 51-54, 64-66, 73-84, 87-112, 114, 115, 117, 119, 121, 123, 125, and 127 have been held unsearchable because they are multiple dependent claims not drafted in accordance with PCT Rule 6.4(a).