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[Continued on next page]

(54) Title: PENTOSE FERMENTATION BY A RECOMBINANT MICROORGANISM

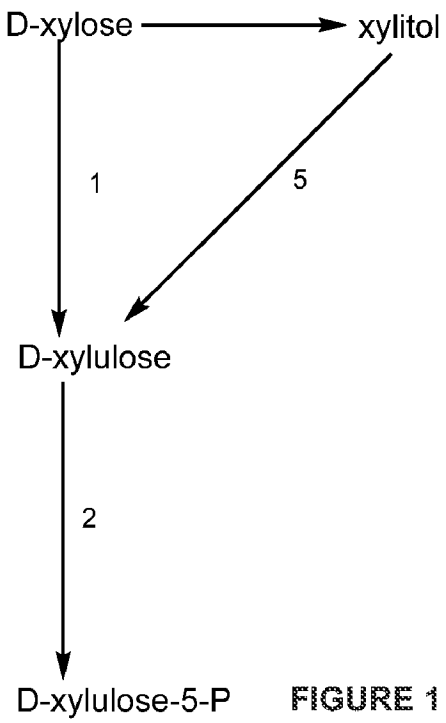


FIGURE 1

(57) Abstract: The present invention provides recombinant nucleic acid constructs comprising a xylose isomerase polynucleotide, a recombinant fungal host cell comprising a recombinant xylose isomerase polynucleotide, and related methods.

WO 2012/009272 A3

WO 2012/009272 A3

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:
1 March 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 11/43548

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - C07H 21/04, C12N 1/15, C12N 1/19 (2011.01)
USPC - 536/23.2
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)
IPC(8) - C07H 21/04, C12N 1/15, C12N 1/19 (2011.01)
USPC - 536/23.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8) - C07H 21/04, C12N 1/15, C12N 1/19 (2011.01), USPC - 536/23.2, 435/254.11, 435/254.2, 435/252 - keyword search, as below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO PubWEST (databases: PGPB,USPT,USOC,EPAB,JPAB), Google Scholar -- Search Terms: xylose, isomerase, xyulose, recombinant, heterologous, exogenous, xenogenous, fungus, fungi, yeast, cereviseae, pombe, saccharomyces, schizosaccharomyces, host, expression, Firmicutes, Lactobacillus, Aerococc$, Abiotroph$

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 2010/0086965 A1 (VAN MARIS et al.) 8 April 2010 (08.04.2010) para [0083]; [0085]; [0156]; [0072]	1-4, 16 --- 5
Y --- A	WEINSTOCK et al. UniProtKB/TrEMBL accession C4G751, 07 July 2009 (07.07.2009) [online]. [Retrieved on 2011.12.15]. Retrieved from the internet: <URL: http://www.uniprot.org/uniprot/C4G751.txt?version=8>	1-4, 16 --- 5
A	WO 2010/000464 A1 (BRAT et al.) 7 January 2010 (07.01.2010) SEQ ID NO: 2, 3.	5
A	US 2010/0129885 A1 (KHRAMTSOV et al.) 27 May 2010 (27.05.2010) entire document	1-5, 16
A	BRAT et al., Functional Expression of a Bacterial Xylose Isomerase in Saccharomyces cerevisiae. Appl. Env. Micro., April 2009; Vol. 75, No. 8; pg. 2304-2311.	1-5, 16

☐ Further documents are listed in the continuation of Box C. ☐

* 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	Date of mailing of the international search report
15 December 2011 (15.12.2011)	09 JAN 2012
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

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 11/43548

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.: 6-15 and 17-39
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:

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.:

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.