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- with international search report (Art. 21(3))
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- with sequence listing part of description (Rule 5.2(a))

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29 November 2012

(54) Title: ALCOHOL PRODUCTION FROM RECOMBINANT MICROORGANISMS



Figure 1A

(57) Abstract: Provided are microorganisms that catalyze the synthesis of biofuels from a suitable carbon dioxide. Also provided are methods of generating such organisms and methods of synthesizing biofuels using such organisms. Provided are microorganisms comprising non-naturally occurring metabolic pathway for the production of higher alcohols.



**A. CLASSIFICATION OF SUBJECT MATTER***C12N 1/21(2006.01)i, C12N 15/52(2006.01)i, C12P 7/06(2006.01)i, C12P 7/04(2006.01)i, C12R 1/145(2006.01)n*

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 1/21; C12P 7/16; C12P 7/42; C10L 1/30; C12R 1/19

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) &amp; Keywords: 6-8 alcohol, beta-ketothiolase, acetyl-Co A acetyltransferase, 3-hydroxybutyryl CoA dehydrogenase, crotonase, trans-2-enoyl-CoA reductase, atoB, bktB, hbd, paaH1, crt, ter gene

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	DEKISHIMA, Y. et al., JACS, (2011) Vol.133, pp.11399-11401 See the whole document.	1-29,31-33
PX	TSENG, H. C., (2011) Production of Pentanol in Metabolically Engineered Escherichia coli, Ph.D. THESIS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY See the entire document; especially, figures 1-4,5-1,5-2,5-5.	1-29,31-33
A	WO 2010-101651 A1 (MASSACHUSETTS INSTITUTE OF TECHNOLOGY) 10 September 2010 See the whole document.	1-29,31-33
A	ATSUMI, S. & LIAO, J. C., CURR. OPIN. BIOTECHNOL. (2008) Vol.19, pp.414-419 See the whole document.	1-29,31-33
A	US 2009-0111154 A1 (LIAO, J. C. et al.) 30 April 2009 See the whole document.	1-29,31-33
A	WO 2009-105733 A2 (LEE, J. W.) 27 August 2009 See the whole document.	1-29,31-33
A	ATSUMI, S. et al., METABOLIC ENGINEERING (2008) Vol.10, pp.305-311	1-29,31-33

 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

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"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

"&amp;" document member of the same patent family


Date of the actual completion of the international search

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Date of mailing of the international search report

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Name and mailing address of the ISA/KR


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 189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan  
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**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2012/031628**

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	See the whole document. US 2008-0274524 A1 (BRAMUCCI, M. G. et al.) 06 November 2008 See the whole document.	1-29,31-33

**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.: 30, 34, 35  
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 an additional fee, this Authority did not invite payment of any additional fee.
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.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2012/031628**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010-101651 A1	10.09.2010	CN 102439133 A EP 2403965 A1 US 2010-0255549 A1	02.05.2012 11.01.2012 07.10.2010
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