



(43) International Publication Date
27 December 2012 (27.12.2012)

(51) International Patent Classification:

<i>C12P 1/00</i> (2006.01)	<i>C12N 15/70</i> (2006.01)
<i>C12N 1/00</i> (2006.01)	<i>C12N 15/74</i> (2006.01)

(21) International Application Number:

PCT/US2012/043117

(22) International Filing Date:

19 June 2012 (19.06.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/500,131	22 June 2011 (22.06.2011)	US
61/502,702	29 June 2011 (29.06.2011)	US

(71) **Applicant** (for all designated States except US): **GENO-**

MATICA, INC. [US/US]; 10520 Wateridge Circle, San Diego, CA 92121 (US).

(72) Inventors; and

(75) **Inventors/Applicants** (for US only): **BURGARD, An-**

thony, P. [US/US]; 237 Walker Crossing, Bellefonte, PA 16823 (US). **BURK, Mark, J.** [US/US]; 12634 Intermezzo Way, San Diego, CA 92130 (US). **OSTERHOUT, Robin, E.** [US/US]; 4910 Orchard Ave., San Diego, CA 92107 (US). **SUN, Jun** [CN/US]; 8274 Bryn Glen Way, San Diego, CA 92129 (US). **PHARKYA, Priti** [IN/US]; 11125 Caminito Alvarez, San Diego, CA 92126 (US).

(74) **Agents:** GAY, David A. et al.; Jones Day, 222 East 41st

Street, New York, NY 10017-6702 (US).

(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, 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, 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, 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, ML, MR, NE, SN, TD, TG).

Published:

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

(88) Date of publication of the international search report:

1 May 2014

(54) Title: MICROORGANISMS FOR PRODUCING 1,3-BUTANEDIOL AND METHODS RELATED THERETO

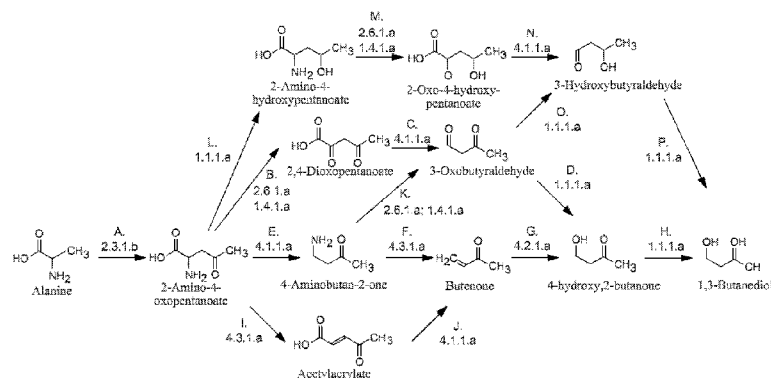


FIG. 1

(57) Abstract: Provided herein is a non-naturally occurring microbial organism having a 1,3-butanediol (1,3 -BDO) pathway and comprising at least one exogenous nucleic acid encoding a 1,3 -BDO pathway enzyme expressed in a sufficient amount to produce 1,3 -BDO. In some embodiments, the pathway includes reducing equivalents from CO or hydrogen. In certain embodiments, a 1,3-BDO pathway proceeds by way of central metabolites pyruvate, succinate or alpha-ketoglutarate. Also provided herein is a method for producing 1,3-BDO, includes culturing such microbial organisms under conditions and for a sufficient period of time to produce 1,3-BDO.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/43117

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12P 1/00; C12N 1/00, 15/70, 15/74 (2012.01)
USPC - 435/41, 243, 471

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 - 435/41, 243, 471

IPC(8) - C12P 1/00; C12N 1/00, 15/70, 15/74 (2012.01)

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

USPC - 435/252.3, 254.11, 257.2
(Text Search)

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

PubWEST (PGPB,USPT,USOC, EPAB,JPAB), Google Patents and Google Scholar.

Search Terms: 1,3-butanediol, 1,3-butanediol pathway, microbial organism, reduce CO or hydrogen, TCA pathway enzyme, ATP-citrate lyase or citrate lyase or fumarate reductase or alpha-ketoglutarate:ferredoxin oxidoreductase; pyruvate:ferredoxin oxidoreductase.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0129904 A1 (BURGARD et al.) 02 June 2011 (02.06.2011) Tables 26, 36; para [0010]-[0012], [0050], [0062], [0063], [0066], [0071], [0113], [0127]	1-14
Y	US 2010/0330635 A1 (BURGARD et al.) 30 December 2010 (30.12.2010) entire document.	1-14

☐ 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

05 September 2012 (05.09.2012)

Date of mailing of the international search report

14 SEP 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