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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,  
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MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,  
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(54) **Title:** ANTIMICROBIAL METHOD FOR FERMENTATION PROCESSES

(57) **Abstract:** A system and method for controlling bacteria, especially lactic and acetic acid bacteria in the production of ethanol using an organic oxidizing compound in combination with an inorganic oxidizer is provided. Particularly, a mixture of one or more peroxy acids and one or more peroxide compounds is introduced into a fermentation mash so as to inhibit or reduce levels of bacteria that compete with yeast for the fermentation sugars. The peroxy acid and peroxide compounds largely are consumed during the fermentation process and are generally not present in the fermentation by-products, especially recovered distiller's grains.

**A. CLASSIFICATION OF SUBJECT MATTER***C12N 1/20(2006.01)i, C12P 7/06(2006.01)i, C12Q 1/02(2006.01)i*

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 1/20; A23L 3/3508; C07C 31/08; C12C 11/00; C12G 1/08; C12P 7/10; C12P 7/14; B01D 15/00; C12P 19/02

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), Google &amp; PubMed

**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 2010-0075006 A1 (SEMENZA, R.) 25 March 2010 See claims 1,2,4,8,9,13,14.	1-9,11-16 10,17-29
Y A	US 2009-0061490 A1 (EDWARDS, J. B. et al.) 05 March 2009 See claims 1,2,6,9,10; fig. 4.	1-9,11-16 10,17-29
Y A	Meneghin, S. P. et al., `Chlorine dioxide against bacteria and yeasts from the alcoholic fermentation`, Brazilian Journal of Microbiology, 2008, Vol. 39, pp. 337-343 See abstract.	1-5,8,9,11-16 6,7,10,17-29
A	US 6569653 B1 (ALARD, G. M. et al.) 27 May 2003 See abstract; column 6, lines 28-31; column 7, lines 57-67.	17-29
A	US 2009-0240088 A1 (FENTON, M. B. M. et al.) 24 September 2009 See claims 49,50; paragraphs [0043],[0155],[0156].	17-29

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

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"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

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

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**PCT/US2011/048962**

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	SEMENZA. R., `Controlling Bacteria During Corn Mash Fermentation: Oxidizers can replace antibiotics in fermentation, boosting ethanol yields`, Ethanol producer magazine, 10 June 2011, URL: <a href="http://www.ethanolproducer.com/articles/7857/controlling-bacteria-during-corn-mash-fermentation">http://www.ethanolproducer.com/articles/7857/controlling-bacteria-during-corn-mash-fermentation</a> See the whole document.	1-29

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2011/048962**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0075006 A1	25.03.2010	None	
US 2009-0061490 A1	05.03.2009	AU 2008-291588 A1 CA 2697073 A1 CN 101821398 A EP 2193205 A1 JP 2010-536389 A WO 2009-026706 A1	05.03.2009 05.03.2009 01.09.2010 09.06.2010 02.12.2010 05.03.2009
US 6569653 B1	27.05.2003	AT 298372 T AU 2000-22992 A1 AU 2000-22992 B2 AU 759404 B2 CA 2360773 A1 CA 2360773 C CN 1189566 C0 CN 1344327 A0 CZ 20012760 A3 CZ 302593 B6 DE 60020940 D1 DE 60020940 T2 EP 1151127 A1 EP 1151127 B1 ES 2244405 T3 FR 2789400 A1 FR 2789400 B1 HU 0105130 A2 HU 0105130 A3 PL 199934 B1 PL 350301 A1 SK 10732001 A3 SK 286464 B6 WO 00-46387 A1 ZA 200106000 A	15.07.2005 25.08.2000 17.04.2003 17.04.2003 10.08.2000 21.09.2010 16.02.2005 10.04.2002 16.01.2002 27.07.2011 28.07.2005 11.05.2006 07.11.2001 22.06.2005 16.12.2005 11.08.2000 20.12.2002 29.05.2002 29.12.2003 28.11.2008 02.12.2002 04.04.2002 06.11.2008 10.08.2000 21.10.2002
US 2009-0240088 A1	24.09.2009	AU 2005-266144 A1 CA 2573712 A1 CA 2685537 A1 CA 2741994 A1 EP 1789684 A1 EP 2142658 A1 EP 2142658 B1 EP 2145026 A1 EP 2145026 B1 EP 2340313 A2 JP 2008-508462 A KR 10-2011-0079849 A US 2008-0310970 A1 US 2010-0129888 A1	02.02.2006 02.02.2006 13.11.2008 06.05.2010 30.05.2007 13.01.2010 07.09.2011 20.01.2010 28.09.2011 06.07.2011 21.03.2008 08.07.2011 18.12.2008 27.05.2010

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2010-0233769 A1	16.09.2010
		WO 2006-010949 A1	02.02.2006
		WO 2008-135775 A1	13.11.2008
		WO 2008-135783 A1	13.11.2008
		WO 2010-049815 A2	06.05.2010