

(43) International Publication Date
23 July 2009 (23.07.2009)(10) International Publication Number
WO 2009/090480 A3(51) International Patent Classification:
C12P 7/06 (2006.01) *C12P 7/10* (2006.01)(21) International Application Number:
PCT/IB2008/003536(22) International Filing Date:
18 December 2008 (18.12.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2007 01862 21 December 2007 (21.12.2007) DK
61/015,688 21 December 2007 (21.12.2007) US(71) Applicant (for all designated States except US): **INBI-
CON A/S** [DK/DK]; Kraftværksvej 53, DK-7000 Fred-
ericia (DK).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LARSEN, jan**
[DK/DK]; Osterbro 28, DK-5690 Tommerup (DK).(74) Agent: **BUDDE SCHOU A/S**; Vester Søgade 10,
DK-1601 Copenhagen V (DK).(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).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

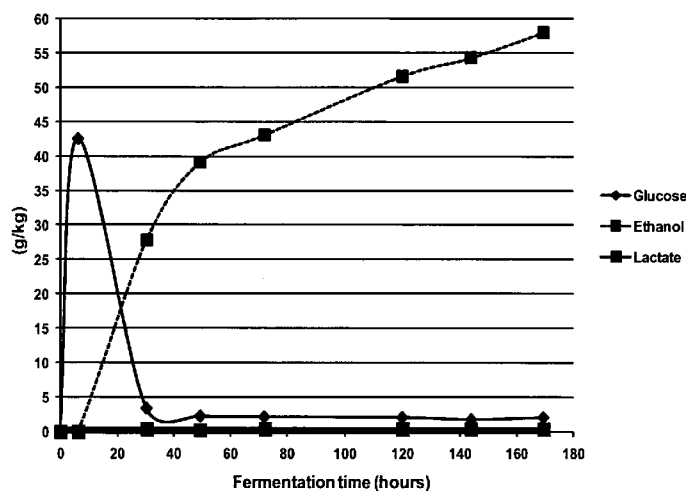
Published:

— 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))

[Continued on next page]

(54) Title: NON-STERILE FERMENTATION OF BIOETHANOL

FIG. 2. Non-sterile pre-hydrolysis and SSF of pretreated wheat
straw having a water/biomass ratio of 5:1.(57) Abstract: A range of concentrations exists
in which fermentation inhibitors derived from
pretreatment of lignocellulosic feed stocks inhib-
it growth of lactic acid bacteria without affecting
fermentive yeast. By optimizing levels of fer-
mentation inhibitors to fall within this range,
yeast fermentations of lignocellulosic biomass
can be conducted under non-sterile conditions
with ethanol yields comparable to those
achieved under sterile conditions. Optimised in-
hibitor levels can be achieved by controlling the
water/biomass ratio of a lignocellulosic biomass
during and after pretreatment, for example by
washing the fiber fraction of a previously pre-
treated lignocellulosic biomass with a pre-de-
fined amount of fresh water or recycled process
solutions. Crude extracts of liquid fraction or
process solutions from pretreatment of lignocel-
lulosic biomass can also provide an effective
anti-bacterial treatment for first generation starch
fermentations.



(88) Date of publication of the international search report:
3 September 2009

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2008/003536

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C12P7/06 C12P7/10

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)

C12P

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

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

EPO-Internal, BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SCHELL ET AL: "Contaminant occurrence, identification and control in a pilot-scale corn fiber to ethanol conversion process" BIORESOURCE TECHNOLOGY, ELSEVIER, GB, vol. 98, no. 15, 1 May 2007 (2007-05-01), pages 2942-2948, XP022036060 ISSN: 0960-8524 cited in the application abstract page 2943, column 1, last paragraph - page 2944, column 2, last paragraph page 2948, column 1 ----- -/--	1,9-11, 13



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 document 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.
- *S* document member of the same patent family

Date of the actual completion of the international search

10 July 2009

Date of mailing of the international search report

20/07/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel (+31-70) 340-2040,
 Fax (+31-70) 340-3016

Authorized officer

De Kok, Ad

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2008/003536

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/056838 A (ELSAM ENGINEERING AS [DK]; DEN KONGELIGE VETERINAER OG LA [DK]; FELBY) 1 June 2006 (2006-06-01) cited in the application examples 3-5 -----	1-8, 12, 13, 16
X	WO 2007/009463 A (HOLM CHRISTENSEN BIOSYSTEMER A [DK]; HOLM CHRISTENSEN BOERGE [DK]; HOL) 25 January 2007 (2007-01-25) page 7, line 11 - page 16, line 4 page 20, line 19 - page 22, line 7 page 24 -----	1-6, 8-13
A		16, 17
X	SAKAI SHINSUKE ET AL: "Effect of lignocellulose-derived inhibitors on growth of and ethanol production by growth-arrested Corynebacterium glutamicum R" APPLIED AND ENVIRONMENTAL MICROBIOLOGY, vol. 73, no. 7, April 2007 (2007-04), pages 2349-2353, XP002536040 ISSN: 0099-2240 cited in the application page 2351, column 2 - page 2352; table 2 -----	14, 15
T	PALMQVIST E ET AL: "FERMENTATION OF LIGNOCELLULOSIC HYDROLYSATES I: INHIBITION AND DETOXIFICATION" BIORESOURCE TECHNOLOGY, ELSEVIER, GB, vol. 74, no. 1, 1 January 2000 (2000-01-01), pages 17-24, XP001016127 ISSN: 0960-8524 page 17 - page 18 -----	1-17
T	KLINKE H B ET AL: "Inhibition of ethanol-producing yeast and bacteria by degradation products produced during pre-treatment of biomass" APPLIED MICROBIOLOGY AND BIOTECHNOLOGY, vol. 66, no. 1, November 2004 (2004-11), pages 10-26, XP002536042 ISSN: 0175-7598 abstract page 11 - page 15 -----	1-17
T	WO 01/60752 A (FORSKNINGSCT RISOE [DK]; AHRING BIRGITTE KIAER [DK]; THOMSEN ANNE BELI) 23 August 2001 (2001-08-23) examples 2, 3 -----	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2008/003536

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2006056838	A	01-06-2006	AU 2005308568 A1	01-06-2006
			BR PI0516665 A	16-09-2008
			CA 2589165 A1	01-06-2006
			CN 101090962 A	19-12-2007
			EP 1828373 A1	05-09-2007
			JP 2008521396 T	26-06-2008
			KR 20070091168 A	07-09-2007
			NI 200700134 A	13-05-2008
			NZ 556159 A	26-09-2008
			US 2008182323 A1	31-07-2008
			US 2008138862 A1	12-06-2008
			ZA 200705180 A	27-08-2008

WO 2007009463	A	25-01-2007	AU 2006272198 A1	25-01-2007
			CA 2615844 A1	25-01-2007

WO 0160752	A	23-08-2001	AT 411971 T	15-11-2008
			AU 3362101 A	27-08-2001
			CA 2400336 A1	23-08-2001
			CN 1443141 A	17-09-2003
			DK 1259466 T3	05-01-2009
			EP 1259466 A1	27-11-2002
			ES 2315272 T3	01-04-2009
			US 2002192774 A1	19-12-2002
