



(51) International Patent Classification:

B01D 61/58 (2006.01) **B01D 61/14** (2006.01)
C22B 3/20 (2006.01) **B01D 11/04** (2006.01)
C22B 60/02 (2006.01)

(21) International Application Number:

PCT/IB2012/052391

(22) International Filing Date:

14 May 2012 (14.05.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2011/03547 13 May 2011 (13.05.2011) ZA

(71) Applicant (for all designated States except US): **SYNEX-US (PTY) LTD** [ZA/ZA]; The Vineyard Center, Suite 100, cnr Adam Tas and Devon Valley Roads, 7600 Stellenbosch (ZA).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **VAN DER WEST-HUYSEN, Johannes, Petrus, Willem** [ZA/ZA]; c/o Synexus (Pty) Ltd, The Vineyard Center, Suite 100, cnr Adam Tas and Devon Valley Roads, 7600 Stellenbosch (ZA).

(74) Agents: **GERNTHOLTZ, Richard, Otto, Paul** et al.; Dr Gerntholtz Inc, P.O. Box 8, 8000 Cape Town (ZA).

(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))

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

10 January 2013

(54) Title: MEMBRANE SOLVENT EXTRACTION PROCESS

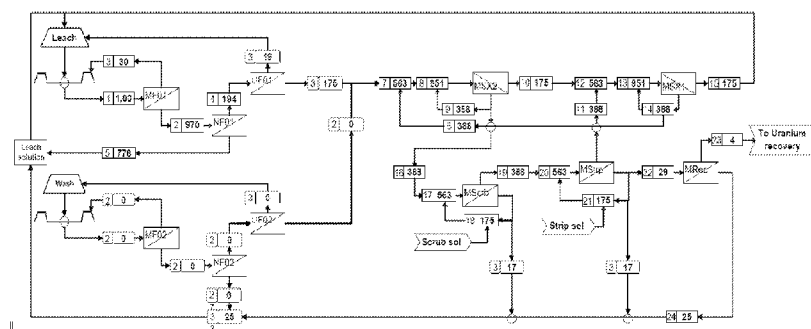


Figure 2

(57) Abstract: The invention discloses a metal extraction process and arrangement therefore which includes a microfiltration plant for removing suspended solids from a pregnant leach solution including a metal to form a first retentate including the solids and a first permeate including the metal; a nanofiltration plant for recovering acid from the first permeate to form a second retentate including the metal and a second permeate; a membrane solvent extraction unit for extracting the metal from the second permeate to form a third retentate being an organic phase including the metal and third permeate being an aqueous phase; a membrane acid strip unit for stripping the third retentate to form a fourth retentate and a fourth permeate including the metal; an acid recovering unit for recovering acid from the fourth permeate to form a fifth permeate and a fifth retentate including the metal which is treated in a metal recovering unit.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/052391

A. CLASSIFICATION OF SUBJECT MATTER

B01D 61/58 (2006.01) C22B 3/20 (2006.01) C22B 60/02 (2006.01) B01D 61/14 (2006.01) B01D 11/04 (2006.01)

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)

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 practicable, search terms used)

WPI, EPODOC; Class marks : /ec/ic C22B3/LOW, C22B26/LOW, C22B60/02/LOW, C22B61, C01G43/01/LOW, C22B11/08, B01D11/04, B01D 61/14/LOW, B01D61/58; /ec B01D11/04C, B01D61/02F OR B01D61/02B OR C22B60/02A6B6; and Keywords (metal, uranium, U3O8, UO2, leach, process-liquor, lixiviant, solvent extraction, nanofiltration, ultrafiltration, Stripping, scrubbing, multi-step, flowsheet and like terms)

ESPACENET, USPTO and GOOGLE Advanced Patent Search with above keywords

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
22 October 2012

Date of mailing of the international search report
22 October 2012

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
Email address: pct@ipaustalia.gov.au
Facsimile No.: +61 2 6283 7999

Authorised officer

Kosala Gunatillaka
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. 0262223652

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/IB2012/052391
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/0028226 A1 (BRISTOW et al.) 04 February 2010 Abstract and claims 1 - 16	1 - 31
A	US 6156186 A (MUELLER et al.) 05 December 2000 Abstract, Fig. 6 and from column 12, line 66 to column 14, line 40	1 - 31

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

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.: **32 - 33: The claims do not comply with Rule 6.2(a) because they rely on references to the description and/or drawings.**
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:
The claim/s do/does not comply with Rule 6.2(a) because it/they rely on references to the description and/or drawings.
3. ☐ Claims Nos.:
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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/IB2012/052391

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 2010/0028226 A1	04 Feb 2010	CA 2731170 A1	04 Feb 2010
		CO 6362053 A2	20 Jan 2012
		KR 20110051201 A	17 May 2011
		MA 32496 B1	01 Jul 2011
		MX 2011000817 A	01 Jun 2011
		PE 06912011 A1	23 Oct 2011
		RU 2011102292 A	10 Sep 2012
		US 2010028226 A1	04 Feb 2010
		US 8226910 B2	24 Jul 2012
		WO 2010014562 A2	04 Feb 2010
US 6156186 A	05 Dec 2000	AU 758572 B2	27 Mar 2003
		AU 1126299 A	24 May 1999
		CA 2307500 A1	14 May 1999
		US 6156186 A	05 Dec 2000
		WO 9923263 A1	14 May 1999
		ZA 9809949 A	30 Jan 2001
End of Annex			

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

Form PCT/ISA/210 (Family Annex)(July 2009)