

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 February 2006 (09.02.2006)

PCT

(10) International Publication Number
WO 2006/015034 A3

(51) International Patent Classification:

B01D 63/10 (2006.01) **C02F 1/469** (2006.01)
B01D 61/44 (2006.01) **B01D 35/30** (2006.01)
B01D 65/00 (2006.01) **B01D 69/06** (2006.01)

(21) International Application Number:

PCT/US2005/026617

(22) International Filing Date: 26 July 2005 (26.07.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

10/900,256 26 July 2004 (26.07.2004) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

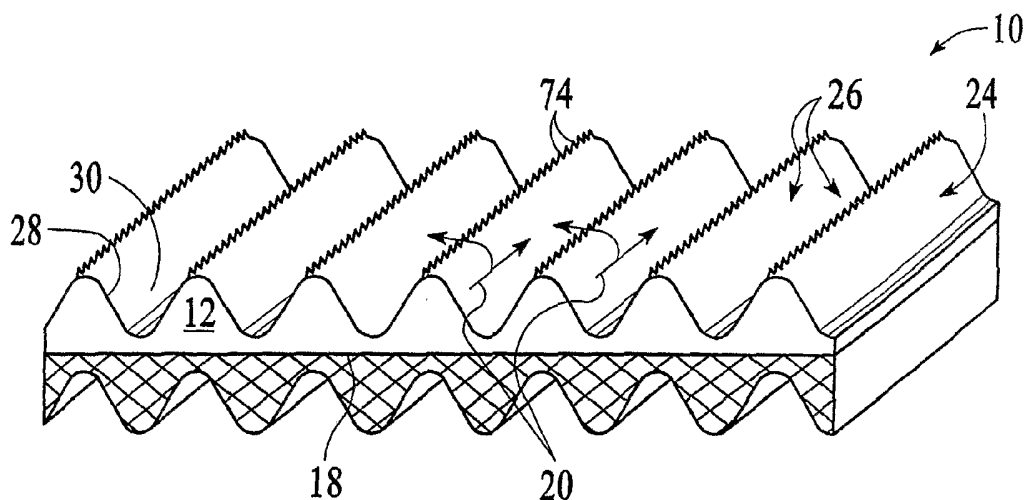
Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
13 July 2006

[Continued on next page]

(54) Title: ELCTROCHEMICAL ION EXCHANGE WITH TEXTURED MEMBRANES AND CARTRIDGE



(57) Abstract: An electrochemical cell (101) comprises an ion exchange membrane (10) having anion and cation exchange materials. The membrane (10) can have separate anion and cation exchange layers (12, 14) that define a heterogeneous water-splitting interface therebetween. In one version, the membrane (10) has textured surface having a pattern of texture features (26) comprising spaced apart peaks (28) and valleys (30). The membranes (10) can also have an integral spacer (80) for insertion in a housing (129) of the electrochemical cell (102). The housing (129) can also have a detachable lid (96) that fits on the cartridge (100). The electrochemical cell (102) can be part of an ion controlling apparatus (120).

WO 2006/015034 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2005/026617

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B01D63/10 B01D61/44 B01D65/00 C02F1/469 B01D35/30
 B01D69/06

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)
 B01D C02F

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/14224 A (IONICS, INCORPORATED; CARSON, WILLIAM, W; MCRAE, WAYNE, A; SIMS, KEITH) 21 February 2002 (2002-02-21) page 10, paragraph 2 - page 11, paragraph 1; figures 5-13 page 13, paragraph 6 - page 14, paragraph 1 page 27, paragraph 3 - page 29, paragraph 1 page 32, paragraph 2 - page 34, paragraph 1 ----- -/--	1-13, 15-21, 23,25, 28-30

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

- * Special categories of cited documents :
- | | |
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| <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"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</p> <p>"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</p> <p>"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.</p> <p>"&" document member of the same patent family</p> |
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Date of the actual completion of the international search 20 October 2005	Date of mailing of the international search report 12. 05. 06
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Goers, B
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2005/026617

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 103 078 A (HITCHEMS ET AL) 15 August 2000 (2000-08-15) column 2, line 14 - column 3, line 24; figures 1-8 column 10, line 57 - column 14, line 7 column 7, line 23 - column 8, line 2 -----	1-10,17, 18
P,X	WO 2005/009596 A (UNIVERSITAET STUTTGART; EIGENBERGER, GERHARD; STRATHMANN, HEINER; GRAB) 3 February 2005 (2005-02-03) abstract; figures -----	1-10,17, 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2005/026617

Box 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.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box 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:

see additional sheet

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.:

1-30

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-30

Electrochemical device with textured bipolar membranes.

2. claims: 31-35

Housing system suitable for an electrochemical ion exchange cartridge with a locking system based on a keyhole in the lid for receiving the end cap extension (cartridge neck).

3. claims: 36-39

Housing system suitable for an electrochemical ion exchange cartridge with a locking system comprising a lid with a hollow post for receiving the end cap extension (cartridge neck), said lid being locked to the housing with pins received in a groove (bayonet-type).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2005/026617

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
WO 0214224	A	21-02-2002	AU 8331301 A CN 1468199 A EP 1307406 A1 JP 2004507342 T	25-02-2002 14-01-2004 07-05-2003 11-03-2004

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