(19) World Intellectual Property Organization

International Bureau





(43) International Publication Date 23 November 2006 (23.11.2006)

(10) International Publication Number WO 2006/123317 A3

- (51) International Patent Classification: *H01L 41/047* (2006.01) *H01L 41/083* (2006.01)
- (21) International Application Number:

PCT/IB2006/051598

- (22) International Filing Date: 19 May 2006 (19.05.2006)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:

PCT/IB2005/051627 19 May 2005 (19.05.2005) IB

- (71) Applicant (for all designated States except US): ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (EPFL) [CH/CH]; CM-Ecublens, CH-1015 Lausanne (CH).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): DUBOIS, Philippe [CH/CH]; CH-2074 Marin-epagnier (CH). KOSTER, Sander [NL/NL]; Karnstraat 28, NL-1445KV Purmerend (NL). MIKHAILOV, Serguei [RU/CH]; Rue Sentier Du Ministre 22, CH-2014 Bôle (CH).
- (74) Agent: ROLAND, André; c/o ANDRE ROLAND S.A., P.o. Box 1255, CH-1001 Lausanne (CH).

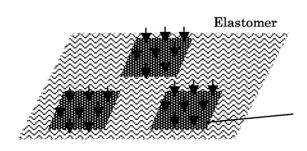
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, 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
- (88) Date of publication of the international search report: 1 March 2007

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.

(54) Title: DIELECTRIC ELECTROACTIVE POLYMER



Implantation of metallic ions

Compliant conducting electrodes (i.e., implanted elastomer)

(57) Abstract: Dielectric electroactive polymer comprising an elastomer layer arranged between two compliant elastomer electrodes characterized by the fact that at least one of said compliant elastomer electrodes is obtained by ion implantation on said elastomer layer. The dielectric electroactive polymer according to the invention may advantageously be used in an actuator, a sensor or in a power source. The invention also includes a process for manufacturing a dielectric electroactive polymer.





INTERNATIONAL SEARCH REPORT

International application No PCT/IB2006/051598

A. CLASSIFICATION OF SUBJECT MATTER INV. H01L41/047 H01L41/083

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

 $\begin{array}{ccc} \mbox{Minimum documentation searched (classification system followed by classification symbols)} \\ \mbox{H01L } & \mbox{H02N} & \mbox{F15C} & \mbox{F04B} \end{array}$

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, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of t	the relevant passages	Relevant to claim No.
X Y	US 2003/080442 A1 (UNGER MARK 1 May 2003 (2003-05-01) paragraphs [0260] - [0263], [[0278]; figures 34A,34B,36A,36	[0277],	1-3,5,8 4,6,7,9
Υ .	US 6 812 624 B1 (PEI QIBING [US 6 812 624 B1 (PEI QIBING [US 2 November 2004 (2004-11-02) column 1, lines 60-64 column 22, lines 3-17 figures 2G,7B-7F	JS] ET AL)	4,6,7,9
A	US 2003/141473 A1 (PELRINE ROM ET AL) 31 July 2003 (2003-07-3 figures 3A-3D		1,8
<u> </u>	ner documents are listed in the continuation of Box C.	X See patent family annex.	
"A" docume consid "E" earlier of filing d "L" docume which in citation "O" docume other n "P" docume	nt which may throw doubts on priority claim(s) or is cited to establish the publication date of another n or other special reason (as specified) ent referring to an oral disclosure, use, exhibition or	"T" later document published after the inte or priority date and not in conflict with cited to understand the principle or the invention "X" document of particular relevance; the cannot be considered novel or cannot involve an inventive step when the do "Y" document of particular relevance; the cannot be considered to involve an inventive step when the do "cannot be considered to involve an involve an involve an involve an involve and comment is combined with one or moments, such combination being obvious in the art. "&" document member of the same patent."	the application but sory underlying the laimed invention be considered to cument is taken alone laimed invention ventive step when the re other such docu- is to a person skilled
	actual completion of the international search November 2006	Date of mailing of the international sea $04/12/2006$	rch report
Name and m	nalling 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 Meul, Hans	

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2006/051598

		PCT/IB2006/051598
<u> </u>	tion). DOCUMENTS CONSIDERED TO BE RELEVANT	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PELRINE R E ET AL: "Electrostriction of polymer dielectrics with compliant electrodes as a means of actuation" SENSORS AND ACTUATORS A, ELSEVIER SEQUOIA S.A., LAUSANNE, CH, vol. 64, no. 1, January 1998 (1998-01), pages 77-85, XP004102141 ISSN: 0924-4247 the whole document	1,8
Ρ,Χ	DUBOIS P ET AL: "Microactuators based on ion-implanted dielectric electroactive polymer membranes (EAP)" THE 13TH INTERNATIONAL CONFERENCE ON SOLID-STATE SENSORS, ACTUATORS AND MICROSYSTEMS, SEOUL, KOREA, JUNE 5-9, 2005; DIGEST OF TECHNICAL PAPERS TRANSDUCERS '05, PISCATAWAY, NJ, USA,IEEE, 5 June 2005 (2005-06-05), pages 2048-2051, XP010828773 ISBN: 0-7803-8994-8 the whole document	1,8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2006/051598

Patent document cited in search report		Publication date	Patent family member(s)		Publication date	
US 2003080442	A1	01-05-2003	US	2006118895 A1	08-06-2006	
US 6812624	B1	02-11-2004	US	2004263028 A1	30-12-2004	
US 2003141473	A1	31-07-2003	NONE			