(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 December 2008 (04.12.2008)

PCT

(10) International Publication Number
WO 2008/147497 A3

(51) International Patent Classification:
G01N 27/30 (2006.01) *H01L 29/786* (2006.01)
G01N 27/414 (2006.01)

(21) International Application Number:
PCT/US2008/005743

(22) International Filing Date: 5 May 2008 (05.05.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/927,470 3 May 2007 (03.05.2007) US

(71) Applicant *(for all designated States except US)*: **THE REGENTS OF THE UNIVERSITY OF CALIFORNIA** [US/US]; 1111 Franklin Street, Oakland, CA 94607-5200 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **KUMMEL, Andrew, C.** [US/US]; 500 West Harbor Drive, Apt. 323, San Diego, CA 92101 (US). **YANG, Dengliang** [CN/US]; 3951 A Miramar Street, La Jolla, CA 92037 (US). **TROGLER, William, C.** [US/US]; 2460 Cordero Road, Del Mar, CA 92014 (US). **GREDIG, Thomas** [CH/US]; 16611 Charles Lane, Huntington Beach, CA 92647 (US).

(74) Agent: **FALLON, Steven, P.**; Greer, Burns & Crain, Ltd., 300 S. Wacker Drive - Suite 2500, Chicago, IL 60606 (US).

(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, 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).

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:
7 May 2009

(54) Title: ULTRA-THIN ORGANIC TFT CHEMICAL SENSOR, MAKING THEREOF, AND SENSING METHOD

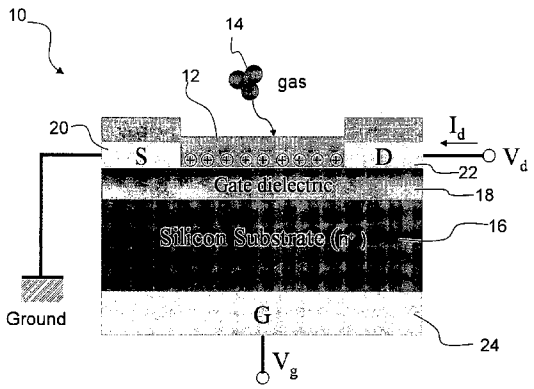

FIG. 1

(57) Abstract: An embodiment of the invention is an organic thin film transistor chemical sensor. The sensor includes a substrate. A gate electrode is isolated from drain and source electrodes by gate dielectric. An organic ultra-thin semiconductor thin film is arranged with respect to the gate, source and drain electrodes to act as a conduction channel in response to appropriate gate, source and drain potentials. The organic ultra-thin film is permeable to a chemical analyte of interest and consists of one or a few atomic or molecular monolayers of material. An example sensor array system includes a plurality of sensors of the invention. In a preferred embodiment, a sensor chip having a plurality of sensors is mounted in a socket, for example by wire bonding. The socket provides thermal and electrical interference isolation for the sensor chip from associated sensing circuitry that is mounted on a common substrate, such as a PCB (printed circuit board). A method of operating an organic thin film transistor chemical sensor exposes the sensor to a suspected analyte. A low duty cycle voltage pulse train is applied to the gate electrode to reduce baseline drift while sensing for a conduction channel change.

WO 2008/147497 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/005743

A. CLASSIFICATION OF SUBJECT MATTER

G01N 27/30(2006.01)i, G01N 27/414(2006.01)i, H01L 29/786(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)

IPC G01N 27/30, 27/414

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)

D/B : eKIPASS

KEY WORD : Organic, Sensor, TFT, Semiconductor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002-0167003 A1 (Ian H. Campbell) 14 NOV. 2002 see page 2, 3, 5; figures 1, 3, 6	1, 7
X / Y	KR 10-2004-0086196 A (Lucent Technologies Inc.) 8 OCT. 2004 see page 1, 4, 5; figures. 1, 2	1, 7 / 15
Y	US 6575013 B2 (Zhenan Bao et al.) 10 JUN. 2003 see page 2, 3, 7; figures. 1, 8	1, 2, 5, 6
Y	US 2002-0117693 A1 (Ananth Dodabalapur et al.) 29 AUG. 2002 see page 5, 7; figures 12	1, 2, 5, 6
X	Thin Solid Films Vol.360: 256-260 (Wenping Hu et al.) Dec. 2000 "The gas sensitivity of a metal-insulator-semiconductor field-effecttransistor based on Langmuir-Blodgett films of a new asymmetrically substituted phthalocyanine" - see page 256-257; figure 2	1

☒ 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 application or patent 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 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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 MARCH 2009 (23.03.2009)	**23 MARCH 2009 (23.03.2009)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

CHOI, SOK JIN

Telephone No. 82-42-481-8472

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/005743

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX/PY	JOURNAL OF APPLIED PHYSICS Vol.102: 034515 (Richard D. Yang et al.) AUG. 2007 "Ultralow drift in organic thin-film transistor chemical sensors by pulsed gating" - see page 34515(1)-34515(4); figure 1	1-5, 9, 10-14 / 15-16
PY	APPLIED PHYSICS LETTERS Vol.90: 263506 (Richard D. Yang et al.) JUN. 2007 "Ultrathin organic transistors for chemical sensing" - see page 263506(1)	15-16
Y	Microelectronic Engineering Vol.67-68: 845?852 (Ch. Pannemann et al.) Dec. 2003 "Nanometer scale organic thin film transistors with Pentacene" - see page 845-846; figure 1	15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2008/005743

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002-0167003 A1	14.11.2002	WO 0208-6979 A1	31.10.2002
KR 10-2004-0086196 A	08.10.2004	CN 1540328 A	27.10.2004
		EP 1464953 A1	06.10.2004
		JP 2004-309483 A	04.11.2004
		US 2004-195563 A1	07.10.2004
		US 7189987 B2	13.03.2007
US 6575013 B2	10.06.2003	DE 60103493 D1	01.07.2004
		DE 60103493 T2	23.06.2005
		EP 1235070 A1	28.08.2002
		EP 1235070 B1	26.05.2004
		EP 1235070 A1	28.08.2002
		EP 1235070 B1	26.05.2004
		JP 2002-310969 A	23.10.2002
		US 2002-116983 A1	29.08.2002
US 2002-0117693 A1	29.08.2002	NONE	