

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
15 May 2003 (15.05.2003)

PCT

(10) International Publication Number
WO 03/041186 A3

(51) International Patent Classification⁷: H01L 51/20,
51/30, 51/40

(21) International Application Number: PCT/US02/33999

(22) International Filing Date: 23 October 2002 (23.10.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/012,655 5 November 2001 (05.11.2001) US

(71) Applicant: 3M INNOVATIVE PROPERTIES COMPANY [US/US]; 3M Center, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(72) Inventors: KELLEY, Tommie, W.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). BOARD-MAN, Larry, D.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). DUNBAR, Timothy, D.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). JONES, Todd, D.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). MUYRES, Dawn, V.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). PEL-LERITE, Mark, J.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). SMITH, Terrance, P.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(74) Agents: WEISS, Lucy, C. et al.; Office of Intellectual Property Counsel, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(81) Designated States (national): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,

LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

Published:

- with international search report

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

20 November 2003

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: ORGANIC THIN FILM TRANSISTOR WITH SILOXANE POLYMER INTERFACE

(57) Abstract: Provided is an organic thin film transistor comprising a siloxane polymeric layer interposed between a gate dielectric and an organic semiconductor layer. An integrated circuit comprising thin film transistors and methods of making a thin film transistor are also provided. The organic thin film transistors of the invention typically exhibit improvement in one or more transistor properties.



WO 03/041186 A3

INTERNATIONAL SEARCH REPORT

Internat. Application No
PCT/US 02/33999

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H01L51/20 H01L51/30 H01L51/40		
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 7 H01L		
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) WPI Data, INSPEC, EPO-Internal, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 5 892 244 A (DOI SYUJI ET AL) 6 April 1999 (1999-04-06) column 2 -column 3; claim 1; figures 1,3 column 5, line 19 - line 32 ---	1,13,14 2-12, 15-22
Y A	US 6 060 333 A (DOI SYUJI ET AL) 9 May 2000 (2000-05-09) column 2, line 10 - line 28 column 2, line 34 - line 36; figure 16 column 5, line 57 -column 6, line 5 --- -/--	1,13,14 2-12, 15-22
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in 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. *Z* document member of the same patent family		
Date of the actual completion of the international search 5 June 2003		Date of mailing of the international search report 13/06/2003
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 Paisdor, B

INTERNATIONAL SEARCH REPORT

Internat	Application No
PCT/US	02/33999

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 786 820 A (MOTOROLA INC) 30 July 1997 (1997-07-30) column 3, line 28 - line 50; claim 1; figure 2	1,13,14
A	---	2-12, 15-22
Y	EP 0 226 208 A (SUMITOMO CHEMICAL CO) 24 June 1987 (1987-06-24) page 1, line 1 - line 37; claim 1; example 1	1,13,14
Y	---	1,13,14
Y	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 06, 30 June 1997 (1997-06-30) & JP 09 040779 A (TOSHIBA CORP), 10 February 1997 (1997-02-10) abstract	1,13,14
Y	---	1,13,14
Y	YONG SUK YANG ET AL: "DEEP-LEVEL DEFECT CHARACTERISTICS IN PENTACENE ORGANIC THIN FILMS" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS, NEW YORK, US, vol. 80, no. 9, 4 March 2002 (2002-03-04), pages 1595-1597, XP001108417 ISSN: 0003-6951 page 1595, column 1, last paragraph -page 1596, column 2	1,13,14
Y	---	1,13,14
Y	EP 1 041 652 A (LUCENT TECHNOLOGIES INC) 4 October 2000 (2000-10-04) cited in the application page 6 -page 7; figure 1; examples; table II	1,13,14
Y	---	1,13,14
Y	DIMITRAKOPOULOS C D ET AL: "ORGANIC THIN-FILM TRANSISTORS: A REVIEW OF RECENT ADVANCES" IBM JOURNAL OF RESEARCH AND DEVELOPMENT, IBM CORPORATION, ARMONK, US, vol. 45, no. 1, 1 January 2001 (2001-01-01), pages 11-27, XP001150345 ISSN: 0018-8646 page 17 -page 20; figures 2A,2B,8	1,13,14
A	---	2-12, 15-22
	page 24, column 2 -----	

INTERNATIONAL SEARCH REPORT

Internat	Application No
PCT/US	02/33999

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5892244	A	06-04-1999	US 6060338 A	09-05-2000
			US 6060333 A	09-05-2000
			WO 9008402 A1	26-07-1990
			JP 2609366 B2	14-05-1997
US 6060333	A	09-05-2000	US 5892244 A	06-04-1999
			WO 9008402 A1	26-07-1990
			JP 2609366 B2	14-05-1997
			US 6060338 A	09-05-2000
EP 0786820	A	30-07-1997	US 6326640 B1	04-12-2001
			EP 0786820 A2	30-07-1997
			JP 9232589 A	05-09-1997
EP 0226208	A	24-06-1987	CA 1281840 A1	19-03-1991
			DE 3682573 D1	02-01-1992
			EP 0226208 A2	24-06-1987
			JP 7091509 B	04-10-1995
			JP 62230828 A	09-10-1987
			KR 9508002 B1	24-07-1995
			MX 169135 B	23-06-1993
JP 09040779	A	10-02-1997	NONE	
EP 1041652	A	04-10-2000	US 6265243 B1	24-07-2001
			EP 1041652 A2	04-10-2000
			JP 2000307172 A	02-11-2000
			US 2001029103 A1	11-10-2001