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(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, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: MULTI-RATE RESIST METHOD TO FORM ORGANIC TFT ELECTRODE AND ELECTRODES FORMED BY SAME

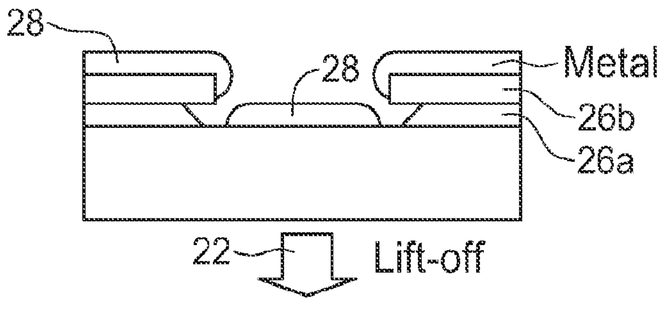

FIG. 3B

(57) **Abstract**: A method for forming a thin film electrode for an organic thin film transistor of the invention provides a multi-layer mask on a substrate with an electrode area opening in a top layer of the mask that is undercut by openings in other layers of the mask. A thin film of metal is deposited in the electrode area on the substrate. Removing the multi-layer mask leaves a well-formed thin film electrode with naturally tapered edges. A preferred embodiment of the invention is a method for forming a thin film electrode for an organic thin film transistor. The method includes depositing a first layer of photoresist on a substrate. The photoresist of the first layer has a first etching rate. A second layer of photoresist is deposited on the first layer of photoresist. The photoresist of the second layer has a second etching rate that is lower than the first etching rate. The first and second layer of photoresist are patterned by exposure. Developing the first and second layers of photoresist provides an electrode area on the substrate. An electrode is deposited in the electrode area. Lift-off of the first and second layers is performed. The electrode that is deposited has a tailored, tapered edge. A preferred embodiment thin film electrode in an organic thin film transistor has a tapered edge with a contact angle of approximately +40 ±4.4°.

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
18 February 2010

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/041255

A. CLASSIFICATION OF SUBJECT MATTER

H01L 29/786(2006.01)i, H01L 21/027(2006.01)i, H01L 51/50(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)
H01L 29/786; H01L 21/283; H01L 21/302; H01L 35/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models since 1975.
Japanese utility models and applications for utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: organic, TFT, photoresist, etching rate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 5240878 A (FITZSIMMONS; JOHN A. et al.) 31 August 1993 See Column 3, Line 6 - Column 5, Line 65, Claims 1-4 and Figures 1A-2E.	1,10 9 2-8,11-17,19,20-22
Y	US 6156665 A (HAMM; ROBERT ALAN et al.) 05 December 2000 See Column 2, Line 15, Claims 1,11 and Figures 7,8.	9
A	US 2003-0047729 A1 (KATSURA HIRAI et al.) 13 March 2003 See abstract and Claim 7	1-17,19-22

☐ 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 21 DECEMBER 2009 (21.12.2009)	Date of mailing of the international search report **28 DECEMBER 2009 (28.12.2009)**
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 KIM Tae Hoon Telephone No. 82-42-481-5728

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/041255

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.:
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 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:

This ISA found multiple inventions as follows:
Group I, claims 1-17 are directed to a method for forming a thin film electrode for an organic thin film transistor.
Group II, claim 19 is directed to a thin film electrode in an organic thin film transistor.
Group III, claims 20,21 are directed to a method for regenerating an organic thin film transistor.
Group IV, claim 22 is directed to a method of manufacturing an OLED display.

The inventions listed as Groups I-IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons; they are separate inventions with distinct fields of search.

1. ☐ As all required addtional 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.:

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/US2009/041255

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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