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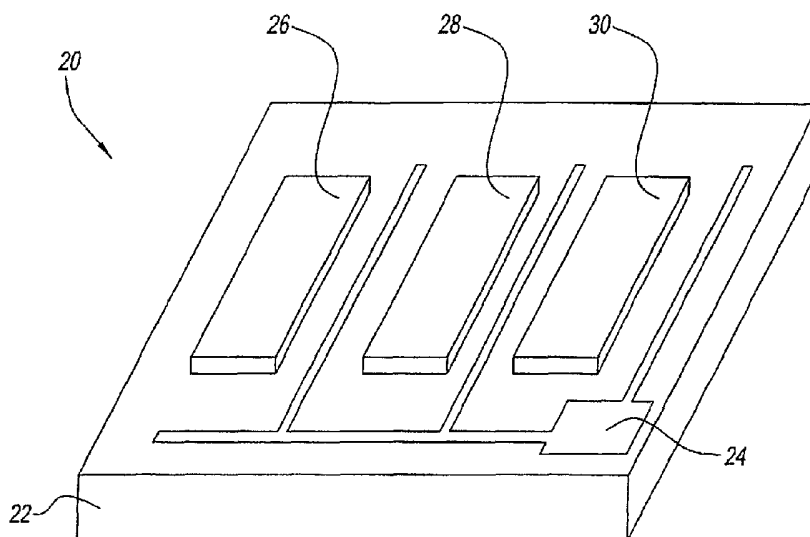
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU,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

[Continued on next page]

(54) Title: GAS SENSOR DEVICE



(57) Abstract: A gas sensor device (10, 32, 48, 62) including a semiconductor substrate (12, 34, 50, 64); one or more catalytic gate-electrodes (14, 44, 58, 70) deposited on a surface of the semiconductor substrate; one or more ohmic contacts (16, 18, 40, 42, 54, 56, 66, 68) deposited on the surface of the semiconductor substrate and a passivation layer (38, 60, 72) deposited on at least a portion of the surface; wherein the semiconductor substrate includes a material selected from the group consisting of silicon carbide, diamond, Group III nitrides, alloys of Group III nitrides, zinc oxide, and any combinations thereof.



MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, 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, IT, LU, 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).

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, 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, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, 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, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

IT, LU, MC, NL, PL, PT, RO, SE, SI, 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 the following designations 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, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, 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, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/033506

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01N27/414

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 G01N

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, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 362 975 A (VON WINDHEIM JESKO ET AL) 8 November 1994 (1994-11-08)	1-7,9
Y	* the whole document; in particular Fig.1,3,11,16 and description thereof *	8
A	-----	10
X	US 5 698 771 A (RYAN MARGARET A ET AL) 16 December 1997 (1997-12-16)	1-7,9
A	column 2, lines 43-63 column 4, line 55 - column 6, line 19 column 8, lines 43-57 column 9, lines 44-47; figure 1 ----- -/-	8,10



Further documents are listed in the continuation of box C.



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.
- "&" document member of the same patent family

Date of the actual completion of the international search

6 April 2005

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/033506

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 6 278 133 B1 (KONSTANTINOV ANDREI ET AL) 21 August 2001 (2001-08-21)	1-7,9
A	column 2, lines 23-25 column 4, lines 14-47 column 5, lines 31-39 column 5, line 65 - column 6, line 4 figure 2	8,10
X	----- SCHALWIG J ET AL: "Gas sensitive GaN/AlGaIn-heterostructures" SENSORS AND ACTUATORS B, ELSEVIER SEQUOIA S.A., LAUSANNE, CH, vol. 87, no. 3, 20 December 2002 (2002-12-20), pages 425-430, XP004393684 ISSN: 0925-4005	1-7,9,10
Y	abstract page 426; figure 1	8
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Y	abstract page 208; figure 1	8
X	----- DE 100 32 062 A (EADS DEUTSCHLAND GMBH) 24 January 2002 (2002-01-24)	1-7,9,10
A	the whole document	8
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Y	page 1168 - page 1169, left-hand column; figure 1	8
A	----- -/--	10

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/033506

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SPETZ A L ET AL: "MISiCFET sensor arrays for on line diagnosis" PROCEEDINGS OF IEEE SENSORS 2003. 2ND. IEEE INTERNATIONAL CONFERENCE ON SENSORS. TORONTO, CANADA, OCT. 22 - 24, 2003, IEEE INTERNATIONAL CONFERENCE ON SENSORS, NEW YORK, NY : IEEE, US, vol. VOL. 2 OF 2. CONF. 2, 22 October 2003 (2003-10-22), pages 1124-1125Vol2, XP010690951 ISBN: 0-7803-8133-5	1,7,9
A	the whole document	8,10
P,X	US 2004/112764 A1 (QIN RENYAN ET AL) 17 June 2004 (2004-06-17) the whole document	1-6
Y	EP 0 398 587 A (THORN EMI PLC) 22 November 1990 (1990-11-22) column 1, lines 1-16 column 3, lines 44-47	8
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Y	EP 1 103 809 A (SIEMENS AKTIENGESELLSCHAFT) 30 May 2001 (2001-05-30) abstract	8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/033506

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.:

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: 1-7,9,10

A gas sensor device inter alia comprising a passivation /
insulating layer;

2. claim: 8

A gas sensor device wherein, inter alia, the gas sensor
being a flip-chip;

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US2004/033506

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