



(43) International Publication Date
20 June 2013 (20.06.2013)

- (51) International Patent Classification:
G01B 11/06 (2006.01)
- (21) International Application Number:
PCT/US2012/069582
- (22) International Filing Date:
13 December 2012 (13.12.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/576,012 15 December 2011 (15.12.2011) US
13/679,128 16 November 2012 (16.11.2012) US
- (71) Applicant: **KLA-TENCOR CORPORATION** [US/US];
Legal Department, One Technology Drive, Milpitas, California 95035 (US).
- (72) Inventors: **JENSEN, Earl**; 625 Barto Street, Santa Clara, California 95051 (US). **O'BRIEN, Kevin**; 750 Fremont Street, Menlo Park, California 94025 (US). **QULI, Farhat**; 852 Kellogg Avenue, Hayward, California 94544 (US). **SUN, Mei**; 1059 Eastwood Dr, Los Altos, CA 94024 (US).
- (74) Agent: **MCANDREWS, Kevin**; KLA-Tencor Corporation, Legal Department, One Technology Drive, Milpitas, US 93035 (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, BN, BR, BW, BY, BZ, CA, CH, CL, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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))

[Continued on next page]

(54) Title: FILM THICKNESS MONITOR

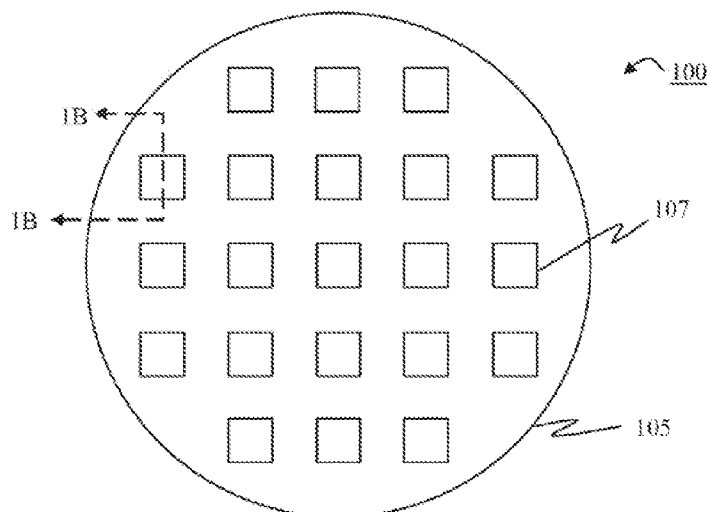


FIG. 1A

(57) Abstract: Aspects of the present disclosure include methods and apparatuses for measuring the rate of change of the thickness of a material layer in situ. A measurement unit comprising a light source and a photodetector may be formed in a cavity in a substrate. The light source produces light that impinges a material layer and is reflected back to the photodetector. Through methods such as interferometry and ellipsometry, the thickness of the material layer may be calculated from the light intensity data measured by the photodetector. It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.



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

4 June 2015

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2012/069582

A. CLASSIFICATION OF SUBJECT MATTER <p style="text-align: center;"><i>G01B 11/06 (2006.01)</i></p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>		
B. FIELDS SEARCHED <p>Minimum documentation searched (classification system followed by classification symbols)</p> <p style="text-align: center;">G01B 9/02, 11/06, 11/30, G01K 11/12</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p> <p>PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, DWPI, EAPATIS, PATENTSCOPE, Information Retrieval System of FIPS</p>		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4957368 A (PHOTOACOUSTIC TECHNOLOGY, INC.) 18.09.1990, col. 1, par. 1-2, col. 4, lines 10-70, col. 6, lines 5-35, col. 7-8, fig. 1, 5	1, 7, 15-16
Y		2-6, 8-14, 17-20
Y	US 6501973 B1 (MOTOROLA, INC.) 31.12.2002, col. 5, 6, 7, lines 5-30, fig. 9-11	2-3, 5, 8-10
Y	US 6654132 B1 (LUXTRON CORPORATION) 25.11.2003, col. 4, lines 25-45	4
Y	US 2010/0128278 A1 (ZYGO CORPORATION et al.) 27.05.2010, [0294]	6
Y	US 5624190 A (ECOLE CENTRALE DE LYON) 29.04.1997, col. 3, lines 30-45	11
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"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	
"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		
Date of the actual completion of the international search	Date of mailing of the international search report	
13 April 2015 (13.04.2015)	23 April 2015 (23.04.2015)	
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer <p style="text-align: center;">E. Rodionova</p> Telephone No. 499-240-25-91	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2012/069582

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2007/0268490 1 (PHOTONIC LATTICE INC. et al.) 22.11.2007, [0007]-[0008], [0030]-[0045]	12-14, 19-20
Y	US 6392756 B1 (N&K TECHNOLOGY, INC.) 21.05.2002, col. 3, lines 35-50, col. 6, lines 30-65	17-18