

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
14 April 2005 (14.04.2005)

PCT

(10) International Publication Number  
**WO 2005/034196 A3**

(51) International Patent Classification<sup>7</sup>: **C30B 25/00**

(21) International Application Number:  
PCT/US2004/032351

(22) International Filing Date:  
30 September 2004 (30.09.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/507,851 30 September 2003 (30.09.2003) US  
10/954,819 29 September 2004 (29.09.2004) US

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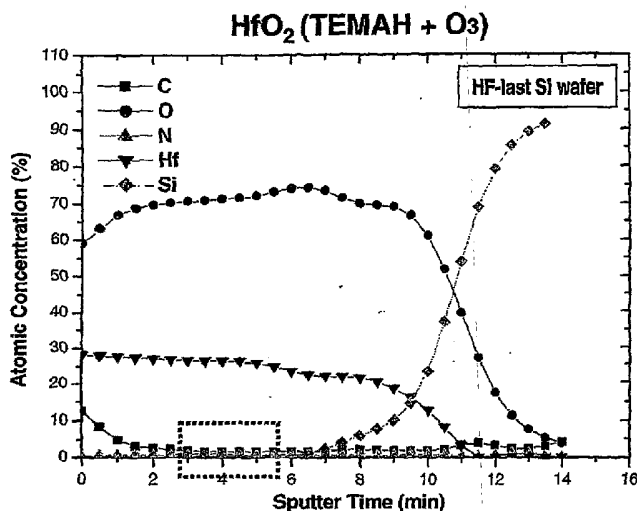
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,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

[Continued on next page]

(54) Title: ATOMIC LAYER DEPOSITION OF HAFNIUM-BASED HIGH-K DIELECTRIC

### AES Analysis of HfO<sub>2</sub> Film obtained from TEMA<sup>®</sup>Hf / O<sub>3</sub>



(57) Abstract: A method of depositing a hafnium-based dielectric film is provided. The method comprises atomic layer deposition using ozone and one or more reactants comprising a hafnium precursor. A semiconductor device is also provided. The device comprises a substrate, a hafnium-based dielectric layer formed atop the substrate, and an interfacial layer formed between the substrate and the hafnium-based dielectric layer, wherein the interfacial layer comprises silicon dioxide and has a crystalline structure.



SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**(15) Information about Correction:**

**Previous Correction:**

see PCT Gazette No. 30/2005 of 28 July 2005, Section II

**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*

*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.*

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

29 December 2005

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/32351

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C30B 25/00

US CL : 117/88

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)  
U.S. : 117/88; 438/785

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 2004/0092073 A1 (CABRAL JR. et al) 13 May 2004	1, 2, 4-9, 11-15
Y		10
Y	US 2002/0195643 A1 (HARADA) 26 December 2002 (26.12.2002) see entire document.	10
A, P	US 2003/0232511 A1 (METZNER et al) 18 December 2003 (18.12.2003) see entire document.	1-15
A	US 2002/0064970 A1 (CHOOI et al) 30 May 2002 (30.05.2002) see entire document.	1-15
A, P	US 6,787,481 B2 (ASAI et al) 07 September 2004 (07.09.2004) see entire document.	1-15

☐ 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	"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
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"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

03 November 2005 (03.11.2005)

10 NOV 2005

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US04/32351

Continuation of B. FIELDS SEARCHED Item 3:

WEST; PGPB, USPT, USOC, EPAB, JPAB, DWPI, TDBD; (precursor same (oxygen or "o.sub.2")) and (hfo or (hafnium adj oxide)) and amorphous.