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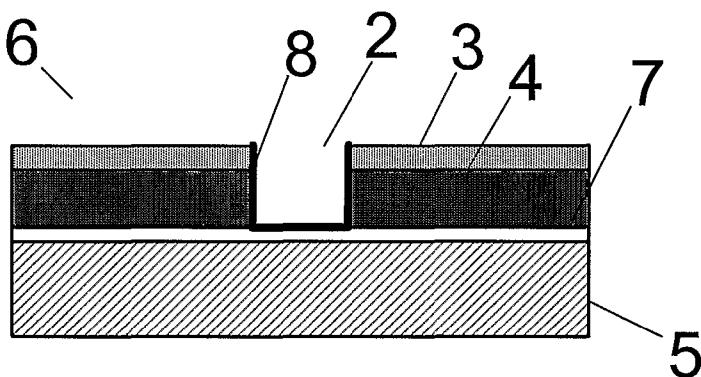
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DAMAGE-FREE ASHING PROCESS AND SYSTEM FOR POST LOW-K ETCH



(57) Abstract: A process is provided for substrate ashing following the etching of features in a low dielectric constant (low-k) layer. The low-k layer can include ultra-low-k material, or a porous low-k material. The process may be configured to remove etch byproducts while preserving feature critical dimension. The ashing process comprises the use of a nitrogen and hydrogen containing chemistry with a passivation chemistry that includes oxygen, such as O₂, CO, or CO₂, or any combination thereof.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/19914

A. CLASSIFICATION OF SUBJECT MATTER IPC: H 01L 21/302 USPC: 438/706,710,711,725 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. : 438/706,710,711,725 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 practicable, search terms used) EAST		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0058397 A1 (SMITH et al.) 16 May 2002 (16.05.2002), paragraphs [0020], [0022], [0031]	1-5 and 7
X	US 2006/0051947 A1 (LIN et al.) 9 March 2006 (09.03.2006), paragraphs [0015], [0022]	1 and 8-10
Y	US 2006/0138399 A1 (ITANO et al.) 29 June 2006 (29.06.2006), paragraph [0009]	6 and 11-13
Y	2005/0029229 A1 (CHAE et al) 10 February 2005 (10.02.2005), paragraph [0045]	6 and 11-13
☐ 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
"E"	earlier application or patent published on or after the international filing date	"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
"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)	"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
"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 18 December 2006 (18.12.2006)		Date of mailing of the international search report 16 MAY 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201		Authorized officer Hsien Ming Lee <i>Hsien Ming Lee</i> Telephone No. 571-272-1863

INTERNATIONAL SEARCH REPORT

International application No.

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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:
Please See Continuation 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 additional fees, this Authority did not invite payment of any additional fees.
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.: 1-14

- 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

International application No.

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BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

Group I, claim(s) 1-14, drawn to a method of removing post-etch residue from a substrate;

Group II, claim(s) 15-21, drawn to a plasma processing apparatus.

Group III, claim(s) 22, drawn to a computer readable medium.

The inventions listed as Groups I, II and III 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: Group I claims a method, Group II claims an apparatus and Group III claims a computer medium. They are independent from each other.