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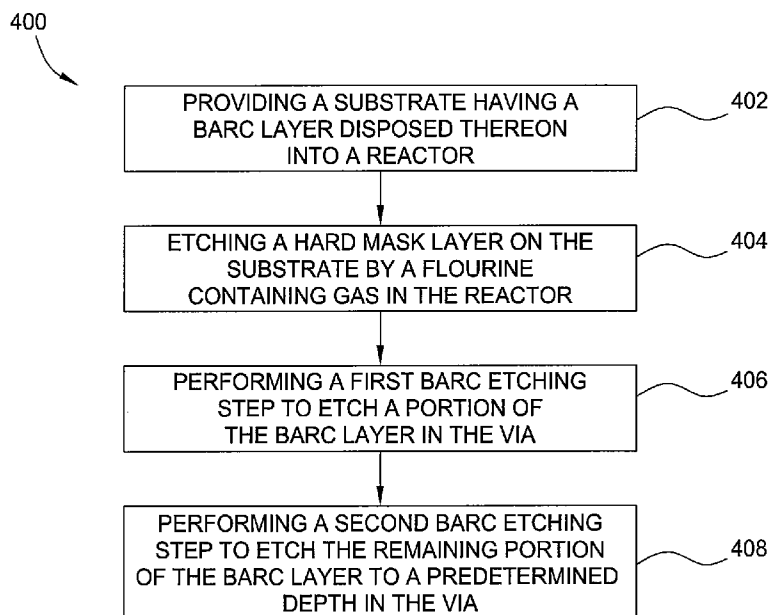
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(54) Title: METHODS FOR ETCHING A BOTTOM ANTI-REFLECTIVE COATING LAYER IN DUAL DAMASCENE APPLICATION



(57) Abstract: Methods for two steps etching a BARC layer in a dual damascene structure are provided. In one embodiment, the method includes providing a substrate having vias filled with a BARC layer disposed on the substrate in an etch reactor, supplying a first gas mixture into the reactor to etch a first portion of the BARC layer filling in the vias, and supplying a second gas mixture comprising NH<sub>3</sub> gas into the reactor to etch a second portion of the BARC layer disposed in the vias.

WO 2007/109464 A3



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC(8) - C03C 25/68;H01L 21/461 (2007.01)  
 USPC - 216/58; 216/67; 257/E21.256  
 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(8) - C03C 25/68;H01L 21/461 (2007.01)  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
 USPC - 216/58; 216/67; 257/E21.256 - see keywords below for text search

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 PubWest (USPT, PGPB, EPAB, JPAB), Google Scholar, WIPO, PubMed  
 Search terms - damascene, dual damascene, photoresist layer, BARC, hard mask layer, flourine, gas, etching, trench lithography, bottom anti-reflective coating, two-step BARC etching, pattern photoresistive layer

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/0157460 A1 (TANAKA et al) 12 August 2004 (12.08.2004), entire document, especially para [0009], [0010], [0005], [0024], [0031], [0032], [0042], [0043]	1-20
Y	US 2005/0079704 A1 (ZHU et al) 14 April 2005 (14.04.2005), para [0034], [0049], Table 2	1-20
Y	US 2003/0119307 A1 (BEKIARIS et al) 26 June 2003 (26.06.2003), Abstract, para [0010], [0036]	9-14, 20
Y	US 6,380,096 B2 (Hung et al.) 30 April 2002 (30.04.2002), Table 5; col 10, ln 28-30	15-20

Further documents are listed in the continuation of Box C.

* 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 but 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	

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