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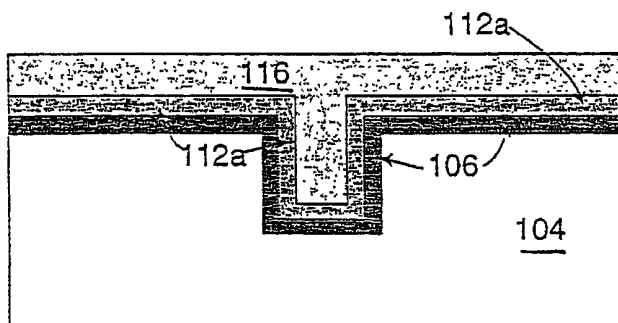
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(54) Title: METHODS FOR REGULATING SURFACE SENSITIVITY OF INSULATING FILMS IN SEMICONDUCTOR DEVICES



(57) Abstract: Methods are provided for regulating surface sensitivity of the deposition of silicon dioxide films that can permit the deposition of high quality silicon dioxide films for use in shallow trench isolation. By the use of super low ozone concentrations to deposit a seed layer (112a) having low ozone content, the subsequent deposition of high-quality, high ozone films (116) can be facilitated, without the appearance of defects that can appear during conventional

high ozone film deposition. Controlling the ozone concentration during seed layer deposition, the thickness of the seed layer, the rates of deposition of the high ozone film, deposition temperature and ozone concentration of the high ozone film, the resulting SiO<sub>2</sub> film can exhibit desired properties. Semiconductor thin films according to the methods of this invention can be made thinner than conventional TEOS/ozone films, permitting the manufacture of integrated circuit devices having smaller dimensions. Additionally, methods are presented for increasing the surface sensitivity of deposition of SiO<sub>2</sub> films on semiconductor wafers having different materials thereon. By increasing surface sensitivity, differential growth rate of SiO<sub>2</sub> on nitride, thermal oxide and silicon can be adjusted to provide increased planarity of the deposited SiO<sub>2</sub> layer and can result in reduced dimensions of SiO<sub>2</sub> layers to achieve planar surfaces and thereby can decrease manufacturing cost and device size.



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INTERNATIONAL SEARCH REPORT

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC(7) : H01L 21/31, B05D 1/26, B05D 5/12, C23C 16/00 US CL : 438/778, 438/787, 427/561, 427/569 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) U.S. : 438/778, 438/787, 427/561, 427/569		
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 - SLO, low ozone SiO2, low ozone TEOS, high ozone SiO2, trench, surface sensitivity		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 5,462,899 (Ikeda) 31 October 1995 (31.10.1995), col. 2, lines 25-37	1, 26 ----- 2, 3, 10, 25, 27
X -- Y	US 5,356,722 (Nguyen et al.) 18 October 1994 (18.10.1994), col. 1, lines 47-53	1, 26 ----- 2, 3, 10, 25, 27
Y	US 5,891,810 (Park et al.) 06 April 1999 (06.04.1999), col. 3, lines 40-60 and col. 4, lines 1-17.	1-3, 10, 25, 27
A	US 5,489,553 (Chen) 06 February 1996 (06.02.1996)	1-281
<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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		
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International application No.  
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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 5,051,380 (Maeda et al.) 24 September 1991 (24.09.1991), col. 3, lines 49-56 and col. 4, lines 1-26	1, 2, 3, 10, 25, 27
X	US 5,420,065 (Phillipossian) 30 May 1995 (30.05.1995), col. 2, lines 27-68.	4
A	US 5,290,358 (Rubloff et al.) 01 March 1994 (01.03.1994)	4-6 and 20-22
A	US 5,458,919 (Okano et al.) 17 October 1995 (17.10.1995)	4-6 and 20-22