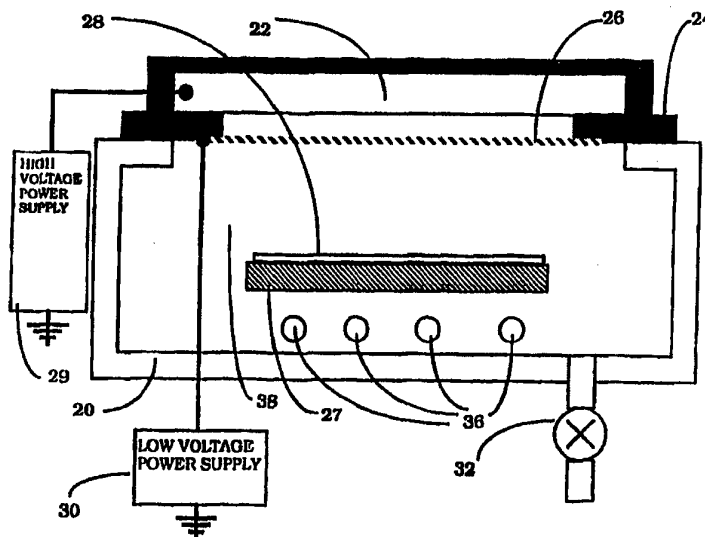




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(21) International Application Number: PCT/US96/06625 (22) International Filing Date: 8 May 1996 (08.05.96) (30) Priority Data: 08/437,461 8 May 1995 (08.05.95) US (71) Applicant: ELECTRON VISION CORPORATION [US/US]; 9019 Via Pasar, San Diego, CA 92126 (US). (72) Inventors: LIVESAY, William, R.; 10317 Leafwood Place, San Diego, CA 92131 (US). ROSS, Matthew, F.; 10590 Canyon Lake Drive, San Diego, CA 92131 (US). RU- BIALES, Anthony, L.; 13746 Ahwahnee Way, Poway, CA 92064 (US). (74) Agent: HEAL, Noel, F.; Suite 316, 2516 Via Tejon, Palos Verdes Estates, CA 90274 (US).		(81) Designated States: CN, JP, KR, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> (88) Date of publication of the international search report: 3 January 1997 (03.01.97)	

(54) Title: METHOD FOR CURING SPIN-ON-GLASS FILM UTILIZING ELECTRON BEAM RADIATION



(57) Abstract

An electron beam exposure method is described which provides a means of curing spin-on-glass (28) formed on a semiconductor wafer (27) which insulates the conductive metal layer and planarizes the topography in the process of manufacturing multilayered integrated circuits. The method utilizes a large area, uniform electron beam exposure system, including a cathode (22), an anode (26) and power supplies (29, 30), in a soft vacuum environment. A wafer (27) coated with uncured siloxane spin-on-glass (28) is irradiated with electrons of sufficient energy to penetrate the entire thickness of the spin-on-glass and is simultaneously heated by infrared heaters. The wafer (27) is exposed to a predetermined dose of electrons (44) while simultaneously raised to a peak temperature in a soft vacuum environment. The electron beam and infrared heaters are then extinguished and the substrate or wafer (27) cooled before removing from vacuum.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 96/06625

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H01L21/316 H01L21/3105 H01L21/48

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 6 H01L

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 376 586 (BEILIN SOLOMON I ET AL) 27 December 1994 see column 4, line 55 - column 6, line 2 ---	1,4
A	US,A,4 222 792 (LEVER REGINALD F ET AL) 16 September 1980 see column 5, line 45 - column 6, line 21; example 1 ---	1
A	US,A,4 596 720 (KERYK JOHN R ET AL) 24 June 1986 see column 8, line 22-42; claims 12-14 ---	1,6,8
A	US,A,5 024 969 (RECHE JOHN J) 18 June 1991 see claims 1-8 -----	1

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Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5376586	27-12-94	JP-A- 7007104	10-01-95
US-A-4222792	16-09-80	CA-A- 1142272	01-03-83
		EP-A- 0025129	18-03-81
		JP-C- 1216438	17-07-84
		JP-A- 56040261	16-04-81
		JP-B- 58051422	16-11-83
US-A-4596720	24-06-86	CA-A- 1283491	23-04-91
		DE-A- 3680625	05-09-91
		EP-A- 0217334	08-04-87
		JP-C- 1735579	17-02-93
		JP-B- 4017991	26-03-92
		JP-A- 62086062	20-04-87
US-A-5024969	18-06-91	NONE	