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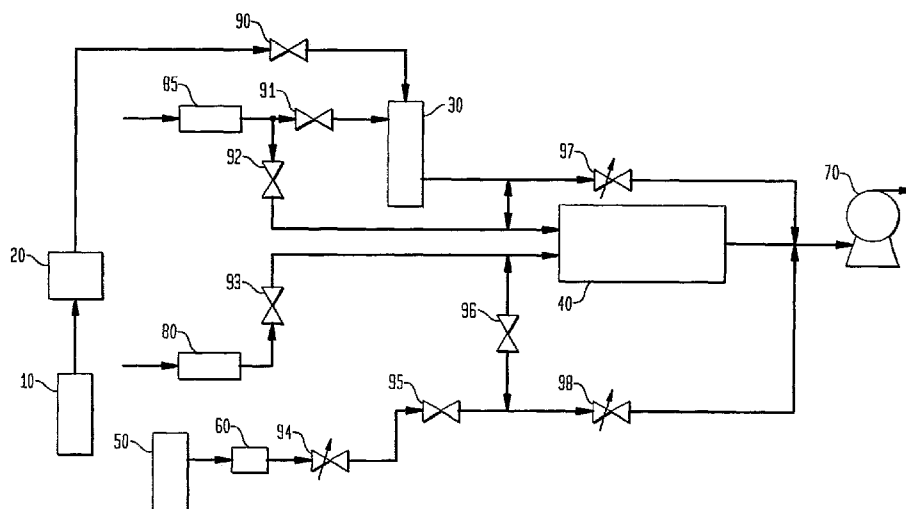
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(54) Title: METHODS AND APPARATUS FOR THE VAPORIZATION AND DELIVERY OF SOLUTION PRECURSORS FOR ATOMIC LAYER DEPOSITION



(57) Abstract: Improved apparatus and methods for atomic layer deposition (ALD) are described. In particular, improved methods and apparatus for the vaporization and delivery of solution ALD precursors are provided. The present invention is particularly useful for processing lower volatile metal, metal oxide, metal nitride and other thin film precursors. The present invention uses total vaporization chambers and room temperature valve systems to generate true ALD vapor pulses while increasing utilization efficiency of the solution precursors.

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C23C 16/00 (2007.10)

USPC - 427/248.1; 118/715

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)
USPC - 427/248.1; 118/715Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 427/248.1; 118/715,726; 428/543,689; 977/Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB,USPT,USOC,EPAB,JPAB); DialogPro (General Research); Google Scholar
Atomic layer deposition, ALD, precursor, source, vessel, first, second, purge, gas, vaporizer, chamber, pump, regulator, controller, mass flow controller, valve, injector, nozzle, liquid, thin film

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2006/0110533 A1 (HWANG et al.) 25 May 2006 (25.05.2006), abstract, Fig. 2, para [0006], [0016]-[0024], [0028], [0029], [0041], [0042], [0069]-[0081], [0092]-[0094], [0100], [0104]-[0108] and [0118]	1-7
Y	US 2006/0144333 A1 (DOAN et al.) 06 July 2006 (06.07.2006), abstract, para [0002]-[0005] and [0017]-[0020]	1-7
Y	US 2006/0035470 A1 (HORII et al.) 16 February 2006 (16.02.2006), abstract, Fig. 1 and 7, para [0001]-[0008], [0013], [0029]-[0038], [0072]-[0075] and [0127]-[0129]	2
A	US 2005/0255243 A1 (SENZAKI) 17 November 2005 (17.11.2005), para [0040] and [0083]	3
A	US 2005/0250347 A1 (BAILEY et al.) 10 November 2005 (10.11.2005), entire document	1-7
A	US 2004/0079286 A1 (LINDFORS) 29 April 2004 (29.04.2004), entire document	1-7

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