

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
6 February 2003 (06.02.2003)

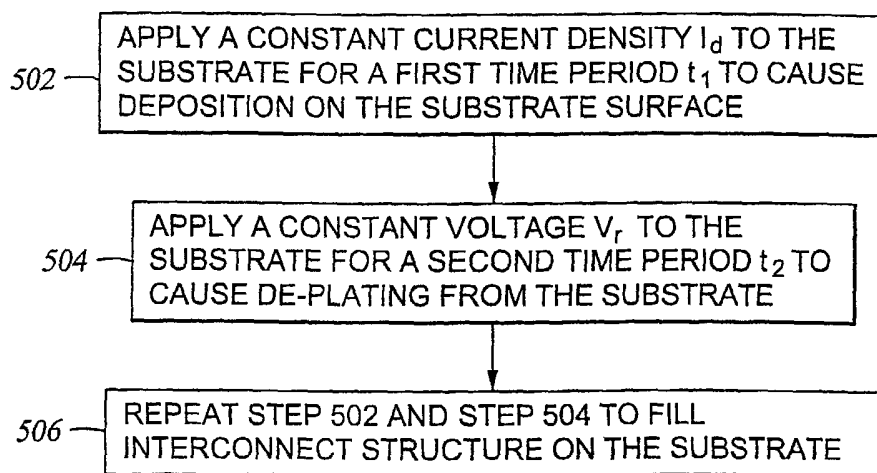
PCT

(10) International Publication Number
WO 2003/010364 A3

- (51) International Patent Classification⁷: C25D 5/18, 7/12
- (21) International Application Number: PCT/US2002/022883
- (22) International Filing Date: 18 July 2002 (18.07.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 09/916,365 26 July 2001 (26.07.2001) US
- (71) Applicant: APPLIED MATERIALS, INC. [US/US]; 3050 Bowers Avenue, Santa Clara, CA 95054 (US).
- (72) Inventors: HEY, H., Peter, W.; 1087 Robbia Drive, Sunnyvale, CA 94087 (US). DORDI, Yezdi; 104 Walter Hays Drive, Palo Alto, CA 94303 (US).
- (74) Agent: TACKETT, Keith, M.; Moser, Patterson & Sheridan, LLP, 3040 Post Oak Blvd., Suite 1500, Houston, TX 77056 (US).
- (81) Designated States (national): CN, JP, KR.
- (84) Designated States (regional): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR).
- Published:
 - with international search report
 - before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report: 18 November 2004

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: DYNAMIC PULSE PLATING FOR HIGH ASPECT RATIO FEATURES



(57) Abstract: A method for depositing a metal on a substrate is provided. The metal is deposited by sequentially applying an electrodeposition pulse followed by an electrodissoolution pulse to the substrate. After each electrodissoolution pulse an before the next electrodeposition pulse there is provided at least one time interval of zero electrical voltage or current, also known as an "off-time", between the pulses. The first two electrodeposition pulses should preferably have the same time durations. Thereafter, the time durations of subsequent electrodeposition pulses are gradually decreased to provide a void-free and seam-free deposition of metal in high aspect ratio features.

WO 2003/010364 A3

INTERNATIONAL SEARCH REPORT

International Application No

US 02/22883

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C25D5/18 C25D7/12

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 7 C25D

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	EP 1 132 500 A (APPLIED MATERIALS INC) 12 September 2001 (2001-09-12) the whole document	1-7, 9-17, 19, 20
X	US 6 099 711 A (KRETSCHMER STEFAN ET AL) 8 August 2000 (2000-08-08) column 5, line 41 - column 6, line 19 column 8, lines 5-15	1, 4, 6, 7, 10, 14, 16, 17, 20 2, 3, 5, 8, 9, 11-13, 15, 18, 19
X	WO 99/54527 A (APPLIED MATERIALS INC) 28 October 1999 (1999-10-28) page 23, line 7 - page 26, line 20	1, 6, 10, 11, 14, 16, 20 2-5, 7-9, 12, 13, 15, 17-19

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *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)
- *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

- *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
- *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
- *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.
- * & * document member of the same patent family

Date of the actual completion of the international search

20 September 2004

Date of mailing of the international search report

27/09/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Van Leeuwen, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/22883

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
EP 1132500	A	12-09-2001	EP 1132500 A2	12-09-2001
			JP 2001303289 A	31-10-2001
			SG 87208 A1	19-03-2002
<hr/>				
US 6099711	A	08-08-2000	DE 19545231 A1	22-05-1997
			AT 190677 T	15-04-2000
			CA 2233329 A1	29-05-1997
			DE 59604701 D1	20-04-2000
			WO 9719206 A1	29-05-1997
			EP 0862665 A1	09-09-1998
			ES 2144789 T3	16-06-2000
			JP 2000500529 T	18-01-2000
			TW 420728 B	01-02-2001
<hr/>				
WO 9954527	A	28-10-1999	EP 0952242 A1	27-10-1999
			EP 0991795 A1	12-04-2000
			JP 3510141 B2	22-03-2004
			JP 11310896 A	09-11-1999
			JP 2002506488 T	26-02-2002
			TW 531569 B	11-05-2003
			WO 9954527 A2	28-10-1999
			US 6113771 A	05-09-2000
			US 6261433 B1	17-07-2001
			US 2003205474 A1	06-11-2003
			US 6350366 B1	26-02-2002
			US 2002063064 A1	30-05-2002