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*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: ELECTROLYTE COMPOSITION AND TREATMENT FOR ELECTROLYTIC CHEMICAL MECHANICAL POLISHING

(57) Abstract: An electrolyte composition and method for planarizing a surface of a wafer using the electrolyte composition is provided. In one aspect, the electrolyte composition includes ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof. The composition has a pH between about 3 and about 10 which is environmentally friendly and does not present hazardous operation concerns. The composition may further comprise one or more additives selected from a group consisting of benzotriazole, ammonium citrate, ethylenediamine, tetraethylenepentamine, triethylenetetramine, diethylenetriamine, amino acids, ammonium oxalate, ammonia, ammonium succinate, and citric acid.



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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/40754

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H01L21/321

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 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)

EPO-Internal, WPI Data, PAJ, INSPEC, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 02 075804 A (APPLIED MATERIALS INC) 26 September 2002 (2002-09-26) paragraph '0123! - paragraph '0139! ---	1-26,28, 29,31-38
P,X	US 2002/108861 A1 (CHADDA SAKET ET AL) 15 August 2002 (2002-08-15)  the whole document ---	1,6,7, 11,20, 25,26, 29,35-38
X	WO 99 65072 A (SPEEDFAM IPEC CORP) 16 December 1999 (1999-12-16)	1,5,6, 11,35, 37,38
Y	page 15, line 32 -page 16, line 3; claims 12,13	39
A	page 17 -page 18  ----- -/--	2,12,20, 36

☒ 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

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"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.

"&amp;" document member of the same patent family

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25 July 2003

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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.
X	US 2001/036746 A1 (KOMAI NAOKI ET AL) 1 November 2001 (2001-11-01) page 10	35,37,38 1,20
A	----	
X	US 6 194 317 B1 (WOOD THOMAS E ET AL) 27 February 2001 (2001-02-27) column 13 -column 15	31,32
X	----	
X	US 6 276 996 B1 (CHOPRA DINESH) 21 August 2001 (2001-08-21) the whole document	31,32
X	----	
P,X	WO 00 55876 A (SUGIYAMA TAKAYUKI ; ITOH HIDEHIKO (JP); OZAWA TADASHI (JP); NIPPON) 21 September 2000 (2000-09-21) the whole document -& EP 1 170 761 A (NIPPON CHEMI-CON CORPORATION OME-SHI) 9 January 2002 (2002-01-09) the whole document	31,32 31,32
X	----	
X	US 4 263 113 A (BERNARD WALTER J) 21 April 1981 (1981-04-21) abstract	31
X	----	
X	CONTOLINI R J ET AL: "ELECTROCHEMICAL PLANARIZATION OF ULSI COPPER" SOLID STATE TECHNOLOGY, COWAN PUBL.CORP. WASHINGTON, US, vol. 40, no. 6, 1 June 1997 (1997-06-01), pages 155-156,158,160, XP000656403 ISSN: 0038-111X the whole document	35,37
Y	----	
Y	US 4 666 683 A (BROWN CRAIG J ET AL) 19 May 1987 (1987-05-19) column 2 column 5	39
A	----	
A	US 3 239 441 A (MAROSI STEPHEN L) 8 March 1966 (1966-03-08) column 7, line 63 -column 10	39
A	----	
A	EP 0 527 537 A (FMC CORP) 17 February 1993 (1993-02-17) the whole document	39
A	----	
A	US 5 002 645 A (VIVIAN THOMAS A ET AL) 26 March 1991 (1991-03-26) column 3	39
A	----	
A	US 6 106 728 A (IIDA SHINYA ET AL) 22 August 2000 (2000-08-22) the whole document	39
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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/40754

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 02075804	A	26-09-2002	US 2002130049 A1 WO 02075804 A2 WO 02085570 A2 US 2002119286 A1	19-09-2002 26-09-2002 31-10-2002 29-08-2002
US 2002108861	A1	15-08-2002	WO 02064314 A1	22-08-2002
WO 9965072	A	16-12-1999	US 6121152 A TW 425665 B WO 9965072 A1	19-09-2000 11-03-2001 16-12-1999
US 2001036746	A1	01-11-2001	JP 2001326204 A JP 2001322036 A US 2003114004 A1	22-11-2001 20-11-2001 19-06-2003
US 6194317	B1	27-02-2001	AU 734883 B2 AU 7170698 A BR 9809311 A EP 1016133 A1 JP 2001523395 T	21-06-2001 24-11-1998 04-07-2000 05-07-2000 20-11-2001
US 6276996	B1	21-08-2001	AU 1724500 A EP 1138069 A2 WO 0028586 A2 US 2001016469 A1	29-05-2000 04-10-2001 18-05-2000 23-08-2001
WO 0055876	A	21-09-2000	EP 1170761 A1 WO 0055876 A1 TW 452810 B US 6493211 B1	09-01-2002 21-09-2000 01-09-2001 10-12-2002
US 4263113	A	21-04-1981	CA 1151102 A1 JP 1380784 C JP 57023100 A JP 61046560 B	02-08-1983 28-05-1987 06-02-1982 15-10-1986
US 4666683	A	19-05-1987	NONE	
US 3239441	A	08-03-1966	GB 1098182 A DE 1521306 A1 GB 962932 A NL 6415051 A	10-01-1968 06-11-1969  28-06-1965
EP 0527537	A	17-02-1993	US 5262018 A AT 118200 T DE 69201366 D1 DE 69201366 T2 DK 527537 T3 EP 0527537 A1 ES 2068000 T3 JP 1922192 C JP 5201964 A JP 6043386 B KR 9506681 B1 MX 9204638 A1	16-11-1993 15-02-1995 23-03-1995 13-07-1995 10-04-1995 17-02-1993 01-04-1995 07-04-1995 10-08-1993 08-06-1994 21-06-1995 01-02-1993
US 5002645	A	26-03-1991	NONE	

## INTERNATIONAL SEARCH REPORT

### Information on patent family members

International Application No

PCT/US 02/40754

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6106728 A	22-08-2000	JP TW	11010540 A 400268 B
			19-01-1999 01-08-2000

# INTERNATIONAL SEARCH REPORT

national application No.  
PCT/US 02/40754

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-38

A method for planarizing a surface of a wafer, comprising:  
disposing the wafer in an electrolyte composition comprising  
a phosphate system, wherein the wafer is connected to an  
electrical power source.

An electrolyte composition.

2. Claim : 39

A method for electrochemically polishing a wafer, comprising:  
disposing the wafer in an electrolyte composition;  
flowing the electrolyte composition through an ion exchange  
resin; and recycling the electrolyte solution to the  
substrate.