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(71) Applicant *(for all designated States except US)*: **APPLIED MATERIALS, INC.** [US/US]; 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ZHANG, Jimin** [US/US]; 398 Huckleberry Drive, San Jose, California 95123 (US). **OSTERHELD, Thomas H.** [US/US]; 1195 Barbara Avenue, Mountain View, California 94040 (US). **CARLSSON, Ingemar** [SE/US]; 3474 Spring Creek Lane, Milpitas, California 95035 (US). **SWEDEK, Boguslaw A.** [PL/US]; 10315 A El Prado Way, Cupertino, California 95014 (US). **JEW, Stephen** [US/US]; 4909 Leigh Avenue, San Jose, California 95124 (US).

(74) Agent: **GOREN, David J.**; Fish & Richardson P.C., P.O. Box 1022, Minneapolis, Minnesota 55440-1022 (US).

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[Continued on next page]

(54) **Title**: ENDPOINT CONTROL OF MULTIPLE-WAFER CHEMICAL MECHANICAL POLISHING

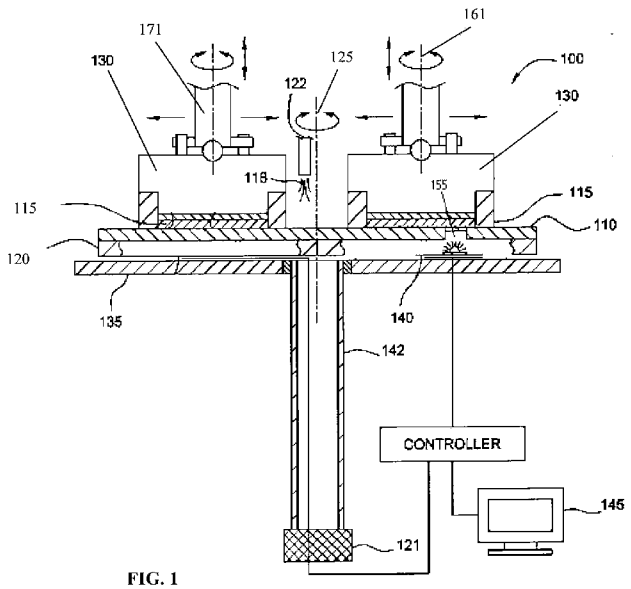

FIG. 1

(57) **Abstract**: A computer-implemented method includes polishing substrates simultaneously in a polishing apparatus. Each substrate has a polishing rate independently controllable by an independently variable polishing parameter. Measurement data that varies with the thickness of each of the substrates is acquired from each of the substrates during polishing with an in-situ monitoring system. A projected thickness that each substrate will have at a target time is determined based on the measurement data. The polishing parameter for at least one substrate is adjusted to adjust the polishing rate of the at least one substrate such that the substrates have closer to the same thickness at the target time than without the adjustment.

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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)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
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eKOMPASS(KIPO internal) & Keywords:"polish","thickness","adjust"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002-0025764 A1 (SEIJI KATSUOKA et al.) 28 February 2002 See the abstract, paragraph [0065], and claims 16-18.	1-15
A	US 6618130 B2 (CHEN; CHARLES) 09 September 2003 See the abstract and claim 1.	1-15
A	US 2008-0051009 A1 (YAN WANG et al.) 28 February 2008 See the whole document.	1-15
A	US 2006-0043071 A1 (LIANG-LUN LEE et al.) 02 March 2006 See the whole document.	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Authorized officer
LEE, Chang Yong
Telephone No. 82-42-481-8225

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Information on patent family members

International application No.

PCT/US2009/062433

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002-0025764 A1	28.02.2002	EP 0954407 A2	10.11.1999
		EP 0954407 B1	21.07.2004
		JP 03-979451 B2	19.09.2007
		JP 11-156712 A	15.06.1999
		JP 11-162893 A	18.06.1999
		KR 10-0524054 B1	26.10.2005
		US 2002-0124373 A1	12.09.2002
		US 2005-0227596 A1	13.10.2005
		US 6332826 B1	25.12.2001
		US 6413146 B1	02.07.2002
		US 6918814 B2	19.07.2005
		US 7101255 B2	05.09.2006
		WO 99-26763 A2	03.06.1999
US 6618130 B2	09.09.2003	US 2003-053042 A1	20.03.2003
US 2008-0051009 A1	28.02.2008	CN 100413032 C0	20.08.2008
		CN 100466188 C0	04.03.2009
		CN 1458671 A	26.11.2003
		CN 1458671 C0	20.08.2008
		CN 1700970 C0	23.11.2005
		CN 1829587 A0	06.09.2006
		CN 1835824 A0	20.09.2006
		CN 1874874 A	06.12.2006
		CN 1874874 C0	06.12.2006
		CN 200970715 Y	07.11.2007
		CN 200970715 Y0	07.11.2007
		CN 2730553 Y0	05.10.2005
		CN 2730554 Y0	05.10.2005
		CN 2737501 Y0	02.11.2005
		CN 2751972 Y0	18.01.2006
		CN 2796944 Y	19.07.2006
		CN 2796944 Y0	19.07.2006
		EP 1361023 A2	12.11.2003
		EP 1361023 A3	07.04.2004
		EP 1361023 B1	12.04.2006
		EP 1386695 A2	04.02.2004
		EP 1386695 A3	09.11.2005
		EP 1613794 A2	11.01.2006
		EP 1648658 A2	26.04.2006
		JP 03-100987 U	04.02.2004
		JP 2004-134732 A	30.04.2004
		JP 2004-134734 A	30.04.2004
		JP 2005-005661 A	06.01.2005
		JP 2005-539384 A	22.12.2005
		JP 2006-527483 A	30.11.2006
		JP 2007-512971 A	24.05.2007
		JP 2007-528794 A	18.10.2007
		KR 10-2003-0087569 A	14.11.2003

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/062433

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		KR 10-2004-0012611 A	11.02.2004
		KR 10-2005-0043972 A	11.05.2005
		KR 10-2006-0035653 A	26.04.2006
		KR 10-2006-0055463 A	23.05.2006
		KR 10-2006-0111651 A	27.10.2006
		KR 10-2007-0103090 A	22.10.2007
		KR 10-2007-0104686 A	26.10.2007
		KR 10-2007-0104870 A	29.10.2007
		KR 20-0321046 Y1	25.07.2003
		KR 20-0331228 Y1	23.10.2003
		KR 20-0331353 Y1	23.10.2003
		KR 20-0331354 Y1	23.10.2003
		TW I300026A	21.08.2008
		US 2002-0098779 A1	25.07.2002
		US 2002-0102853 A1	01.08.2002
		US 2002-0119286 A1	29.08.2002
		US 2003-0209448 A1	13.11.2003
		US 2003-0213703 A1	20.11.2003
		US 2003-0220053 A1	27.11.2003
		US 2004-0020788 A1	05.02.2004
		US 2004-0020789 A1	05.02.2004
		US 2004-0023495 A1	05.02.2004
		US 2004-0023610 A1	05.02.2004
		US 2004-0053512 A1	18.03.2004
		US 2004-0053560 A1	18.03.2004
		US 2004-0082289 A1	29.04.2004
		US 2004-0121708 A1	24.06.2004
		US 2004-0134792 A1	15.07.2004
		US 2004-0163946 A1	26.08.2004
		US 2004-0182721 A1	23.09.2004
		US 2004-0266327 A1	30.12.2004
		US 2005-0000801 A1	06.01.2005
		US 2005-0061674 A1	24.03.2005
		US 2005-0092621 A1	05.05.2005
		US 2005-0133363 A1	23.06.2005
		US 2005-0161341 A1	28.07.2005
		US 2005-0178743 A1	18.08.2005
		US 2005-0194681 A1	08.09.2005
		US 2005-0284770 A1	29.12.2005
		US 2006-0032749 A1	16.02.2006
		US 2006-0148381 A1	06.07.2006
		US 2006-0151336 A1	13.07.2006
		US 2006-0163074 A1	27.07.2006
		US 2006-0172671 A1	03.08.2006
		US 2006-0217049 A1	28.09.2006
		US 2006-0228992 A1	12.10.2006
		US 2006-0231414 A1	19.10.2006
		US 2006-0237330 A1	26.10.2006
		US 2007-0034506 A1	15.02.2007
		US 2007-0066200 A9	22.03.2007

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/062433

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2007-0066201 A1	22.03.2007
		US 2007-0099552 A1	03.05.2007
		US 2007-0111638 A1	17.05.2007
		US 2008-0017521 A1	24.01.2008
		US 2008-0026681 A1	31.01.2008
		US 2008-0108288 A1	08.05.2008
		US 2008-0156657 A1	03.07.2008
		US 2008-0254713 A1	16.10.2008
		US 2008-051009 A1	28.02.2008
		US 2009-0120803 A9	14.05.2009
		US 6537144 B1	25.03.2003
		US 6561873 B2	13.05.2003
		US 6848970 B2	01.02.2005
		US 6884153 B2	26.04.2005
		US 6962524 B2	08.11.2005
		US 6979248 B2	27.12.2005
		US 6988942 B2	24.01.2006
		US 6991526 B2	31.01.2006
		US 6991528 B2	31.01.2006
		US 7029365 B2	18.04.2006
		US 7059948 B2	13.06.2006
		US 7066800 B2	27.06.2006
		US 7070475 B2	04.07.2006
		US 7077721 B2	18.07.2006
		US 7112270 B2	26.09.2006
		US 7125477 B2	24.10.2006
		US 7137868 B2	21.11.2006
		US 7137879 B2	21.11.2006
		US 7207878 B2	24.04.2007
		US 7278911 B2	09.10.2007
		US 7285036 B2	23.10.2007
		US 7294038 B2	13.11.2007
		US 7303462 B2	04.12.2007
		US 7303662 B2	04.12.2007
		US 7311592 B2	25.12.2007
		US 7344431 B2	18.03.2008
		US 7344432 B2	18.03.2008
		US 7374644 B2	20.05.2008
		US 7422516 B2	09.09.2008
		US 7569134 B2	04.08.2009
		US 7628905 B2	08.12.2009
		US 7670468 B2	02.03.2010
		US 7678245 B2	16.03.2010
		WO 2004-024394 A1	25.03.2004
		WO 2004-108358 A2	16.12.2004
		WO 2004-108358 A3	16.12.2004
		WO 2004-111314 A2	23.12.2004
		WO 2004-111314 A3	23.12.2004
		WO 2005-002794 A2	13.01.2005
		WO 2005-002794 A3	13.01.2005

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/062433

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		WO 2005-061177 A1	07.07.2005
		WO 2005-123317 A1	29.12.2005
		WO 2006-036412 A1	06.04.2006
		WO 2006-093625 A1	08.09.2006
US 2006-0043071 A1	02.03.2006	CN 1744285 A	08.03.2006
		CN 1744285 C0	08.03.2006
		TW 271797 A	21.01.2007
		TW 271797 B	21.01.2007