(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 November 2009 (19.11.2009)

PCT

(10) International Publication Number
WO 2009/140172 A3

(51) International Patent Classification:
H01L 21/3065 (2006.01) *H01L 21/027* (2006.01)
H05H 1/34 (2006.01) *G03F 7/20* (2006.01)

(21) International Application Number:
PCT/US2009/043370

(22) International Filing Date:
8 May 2009 (08.05.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/121,711 15 May 2008 (15.05.2008) US

(71) Applicant *(for all designated States except US)*: **LAM RESEARCH CORPORATION** [US/US]; 4650 Cushing Parkway, Fremont, CA 94538 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **SADJADI, S.M. Reza** [US/US]; 20311 Carol Lane, Saratoga, CA 95070 (US).

(74) Agents: **LEE, Michael, B.K.** et al.; Beyer Law Group LLP, P.O. Box 1687, Cupertino, CA 95015-1687 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

[Continued on next page]

(54) Title: SELECTIVE INDUCTIVE DOUBLE PATTERNING

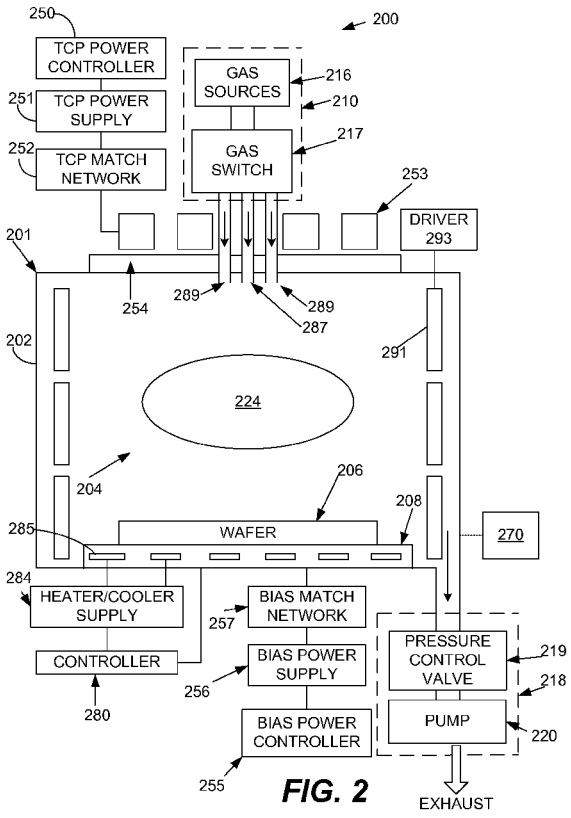


FIG. 2

(57) Abstract: An inductively coupled power (ICP) plasma processing chamber for forming semiconductor features is provided. A plasma processing chamber is provided, comprising a vacuum chamber, at least one antenna adjacent to the vacuum chamber for providing inductively coupled power in the vacuum chamber, a substrate support for supporting a silicon substrate within the plasma processing chamber, a pressure regulator, a gas inlet for providing gas into the plasma processing chamber, and a gas outlet for exhausting gas from the plasma processing chamber. A gas distribution system is in fluid connection with the gas inlet for providing a first gas and a second gas, wherein the gas distribution system can substantially replace one of the first gas and the second gas in the plasma zone with the other of the first gas and the second gas within a period of less than 5 seconds.

WO 2009/140172 A3

ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:
1 April 2010