



- (51) **International Patent Classification:**
H01L 21/465 (2006.01) *H01L 21/46* (2006.01)
- (21) **International Application Number:**
PCT/US2011/058546
- (22) **International Filing Date:**
31 October 2011 (31.10.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
12/938,918 3 November 2010 (03.11.2010) US
- (71) **Applicant (for all designated States except US):** LAM RESEARCH CORPORATION [US/US]; 4650 Cushing Parkway, Fremont, California 94538 (US).
- (72) **Inventor; and**
- (75) **Inventor/Applicant (for US only):** PANAGOPOULOS, Theo [GR/US]; 1556 Darlene Avenue, San Jose, California 95125 (US).
- (74) **Agent:** SKIFF, Peter K.; Buchanan Ingersoll & Rooney PC, P.O. Box 1404, Alexandria, Virginia 22313-1404 (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, CL, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

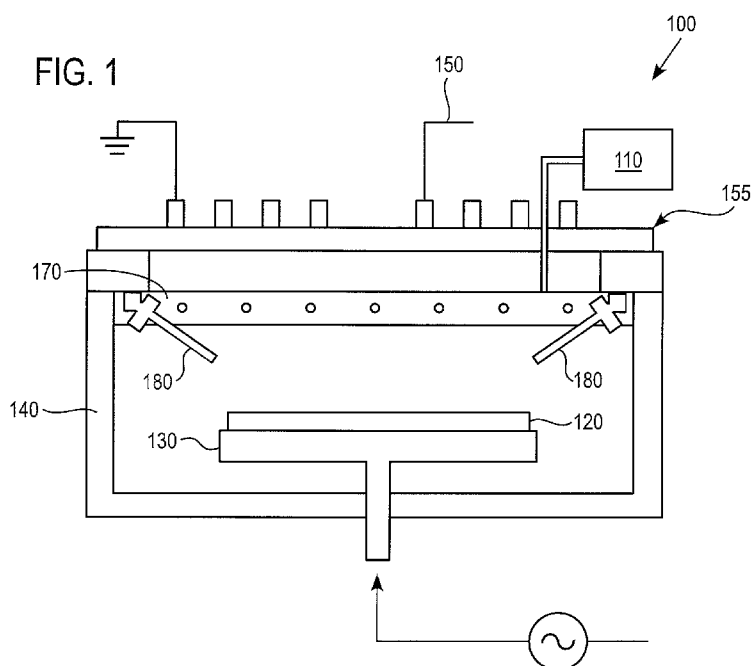
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, 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 applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

[Continued on next page]

- (54) **Title:** RAPID AND UNIFORM GAS SWITCHING FOR A PLASMA ETCH PROCESS



(57) **Abstract:** An inductively coupled plasma processing apparatus includes a processing chamber in which a semiconductor substrate is processed, a substrate support, a dielectric window forming a wall of the chamber, an antenna operable to generate and maintain a plasma in the processing chamber, and a showerhead plate of dielectric material adjacent the dielectric window. The showerhead plate includes gas holes in fluid communication with a plenum below the dielectric window, the plenum having a gas volume of no greater than 500 cm³. The gas holes extend between the plenum and a plasma exposed surface of the showerhead plate and the gas holes have an aspect ratio of at least 2. A gas delivery system is operable to supply an etching gas and a deposition gas into the processing chamber through the showerhead plate while the semiconductor substrate is supported on the substrate support. The plasma processing apparatus can rapidly replace the etching gas in the plenum with the deposition gas within about 200 milliseconds and vice versa. The plasma processing apparatus is operable to etch silicon on the semiconductor substrate at a rate of 10 μ m/minute or higher.

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