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

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 July 2010 (29.07.2010)

PCT

(10) International Publication Number
WO 2010/085293 A8

(51) International Patent Classification:
H01L 21/265 (2006.01) *H01L 21/027* (2006.01)

(21) International Application Number:
PCT/US2009/064794

(22) International Filing Date:
17 November 2009 (17.11.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/206,075 26 January 2009 (26.01.2009) US
12/550,142 28 August 2009 (28.08.2009) US

(71) Applicant: **APPLIED MATERIALS, INC.** [US/US]; 3050 Bowers Avenue, Santa Clara, CA 95054 (US).

(72) Inventors: **HILKENE, Martin, A.**; 1353 Pheasant Drive, Gilroy, CA 95020 (US). **SANTHANAM, Kartik**; 43844 Cameron Hills Drive, Fremont, CA 94539 (US). **TA, Yen, B.**; 10130 Parkwood Drive, Apt. #3, Cupertino, CA 95014 (US). **PORSHNEV, Peter, I.**; 1255 Sierra Village Place, San Jose, CA 95132 (US). **FOAD, Majeed, A.**; 640 Sheraton Drive, Sunnyvale, CA 94087 (US).

(74) Agent: **WALLACE, Robert, M.**; Law Office of Robert M. Wallace, 2112 Eastman Avenue, Suite 102, Ventura, CA 93003 (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, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, 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, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: REDUCING PHOTORESIST LAYER DEGRADATION IN PLASMA IMMERSION ION IMPLANTATION

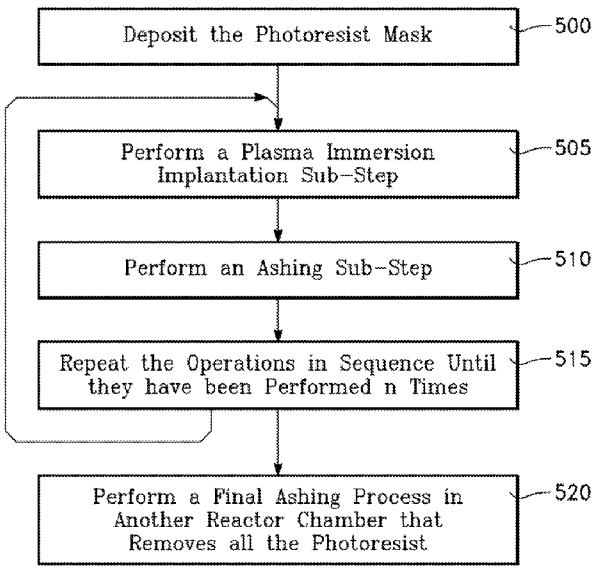


FIG. 3

(57) Abstract: A method, of plasma immersion ion implantation of a workpiece having a photoresist mask on its top surface prevents photoresist failure from carbonization of the photoresist. The method includes performing successive ion implantation sub-steps, each of the ion implantation sub-steps having a time duration over which only a fractional top portion of the photoresist layer is damaged by ion implantation. After each one of the successive ion implantation sub-steps, the fractional top portion of the photoresist is removed while leaving the remaining portion of the photoresist layer in place by performing an ashing sub-step. The number of the successive ion implantation sub-steps is sufficient to reach a predetermined ion implantation dose in the workpiece,

WO 2010/085293 A8

ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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

(48) Date of publication of this corrected version:
29 December 2010

(15) Information about Correction:
see Notice of 29 December 2010