

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
31 July 2025 (31.07.2025)



(10) International Publication Number
WO 2025/159952 A1

(51) International Patent Classification:
H01J 37/32 (2006.01) *H01L 21/67* (2006.01)

(21) International Application Number:
PCT/US2025/011660

(22) International Filing Date:
15 January 2025 (15.01.2025)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
18/420,376 23 January 2024 (23.01.2024) US

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

(72) Inventors: **NEELAMRAJU, Bharati**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **KULSHRESHTHA, Prashant Kumar**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **KAGEYAMA, Yuta**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **KITAGAKI, Takashi**; 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(74) Agent: **BERGSTROM, James T.** et al.; 1100 Peachtree Street NE, Suite 2800, Mailstop: IP Docketing - 22, Atlanta, Georgia 30309 (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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UY, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: PROCESS STAGE TRANSITION DETECTION FOR PLASMA SYSTEMS

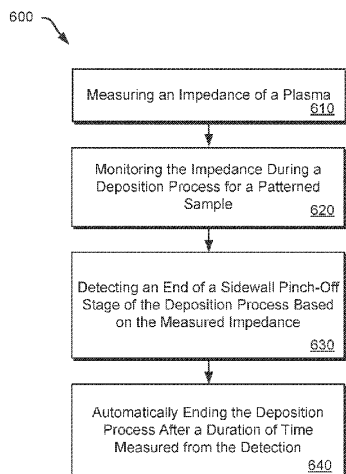


FIG. 6

(57) Abstract: A goal of a gapfill deposition process may be to form a relatively flat overgrowth layer of gapfill material above a top of the pillars. The relatively flat overgrowth layer can be formed by automatically stopping the gapfill deposition process after detecting an end of a stage (e.g., a sidewall growth stage) of the gapfill process. A characteristic of the plasma, such as an impedance of the plasma may be monitored during the plasma process. Changes in the characteristic may be correlated with different stages in the process, such as different stages in the gapfill process. When the characteristic indicates, a stage in the gapfill process may be identified, and an action may be taken, such as stopping the gapfill process. This provides live monitoring of the gapfill based on plasma characteristics rather than on measurements taken after the gap fill process is complete.

WO 2025/159952 A1

[Continued on next page]

Published:

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