

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
20 March 2025 (20.03.2025)



(10) International Publication Number
WO 2025/058994 A1

(51) International Patent Classification:

H01L 21/02 (2006.01) H01L 21/67 (2006.01)
H01L 21/683 (2006.01) H01J 37/32 (2006.01)
H01L 21/687 (2006.01)

(72) Inventors: **HUANG, Yanhui**; 4650 Cushing Pkwy.,
Fremont, California 94538 (US). **BEAUDETTE, Chad
Adrien**; 4650 Cushing Pkwy., Fremont, California 94538
(US).

(21) International Application Number:

PCT/US2024/045876

(74) Agent: **MURRY, Price W.** et al.; WEAVER AUSTIN VIL-
LENEUVE & SAMPSON LLP, P. O. BOX 70250, OAK-
LAND, California 94612-0250 (US).

(22) International Filing Date:

09 September 2024 (09.09.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/582,080 12 September 2023 (12.09.2023) US

(71) Applicant: **LAM RESEARCH CORPORATION**
[US/US]; 4650 Cushing Pkwy., Fremont, California 94538
(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,

(54) Title: A FINITE ELEMENT SIMULATION METHOD TO PREDICT THE FILM THICKNESS PROFILE FROM ZONAL SHOPED

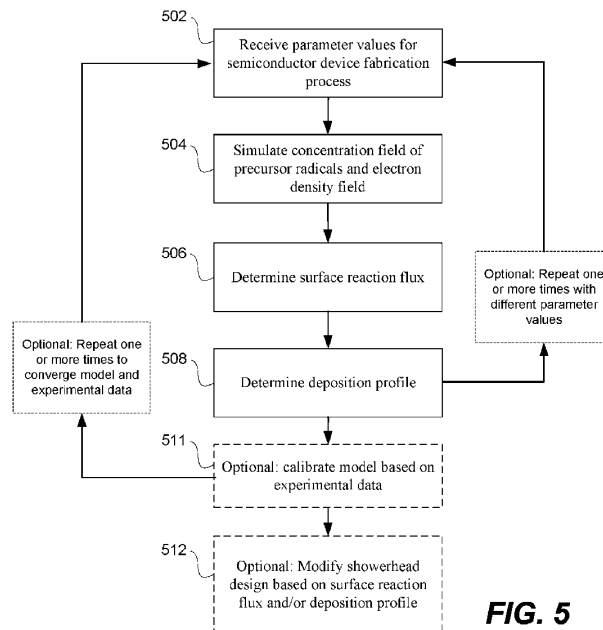


FIG. 5

(57) Abstract: Methods, apparatuses, and computer program products are provided for simulating backside layer deposition. Deposition of a backside layer stack may mitigate wafer bow that varies in orthogonal directions, the deposition comprising receiving parameter values for a plurality of parameters of a semiconductor device fabrication process to deposit a non-uniform profile film on a substrate, wherein the semiconductor device fabrication process is performed by a process chamber having a showerhead with a plurality of zones; performing a simulation of the semiconductor device fabrication process based on the parameter values; and determining a deposition profile of the non-uniform profile film based on the simulation.

[Continued on next page]

TJ, TM, TN, TR, TT, TZ, UA, UG, US, 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).

Published:

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