



(51) International Patent Classification:

H01L 21/67 (2006.01) G01F 23/26 (2006.01)
G05B 23/02 (2006.01) G01F 23/296 (2006.01)

(21) International Application Number:

PCT/US2025/010120

(22) International Filing Date:

02 January 2025 (02.01.2025)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/622,770 19 January 2024 (19.01.2024) US

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

(72) Inventors: **CHANDRASEKHARAN, Ramesh**; 4650
Cushing Pkwy., Fremont, California 94538 (US). **SRINI-
VASAN, Easwar**; 4650 Cushing Pkwy., Fremont, Califor-
nia 94538 (US).

(74) Agent: **DAY, Michael L.** et al.; Weaver Austin Villeneuve
& Sampson LLP, P.O. Box 70250, Oakland, California
94612-0250 (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, 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))

(54) Title: LEVEL MONITORING OF SOLID PRECURSORS

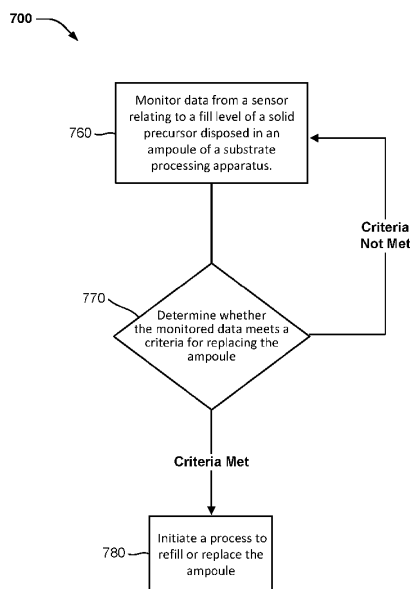


Fig. 7

(57) Abstract: Techniques for monitoring a fill level of solid precursors include

(a) monitoring, with a controller communicatively coupled with at least one sensor, data from the sensor relating to a fill level of a solid precursor disposed in an ampoule of a substrate processing apparatus, where the ampoule is fluidically coupled with a processing chamber and the substrate processing apparatus is configured to cause at least a portion of the solid precursor to sublime, and to deliver resulting gaseous precursor chemicals to the processing chamber; (b) determining whether the monitored data meets a criterion for replacing the ampoule; and, (c) in response to determining that the monitored fill level meets the criterion, initiating a process to refill or replace the ampoule.