

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
30 July 2020 (30.07.2020)



(10) International Publication Number
WO 2020/154009 A1

(51) International Patent Classification:

C23C 16/34 (2006.01) C23C 16/455 (2006.01)
C23C 16/04 (2006.01) C23C 16/56 (2006.01)
C23C 16/452 (2006.01) H01L 21/02 (2006.01)
C23C 16/50 (2006.01)

(21) International Application Number:

PCT/US2019/060757

(22) International Filing Date:

11 November 2019 (11.11.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/796,277 24 January 2019 (24.01.2019) US

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(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, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, 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, 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, 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, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: METHODS FOR DEPOSITING SILICON NITRIDE

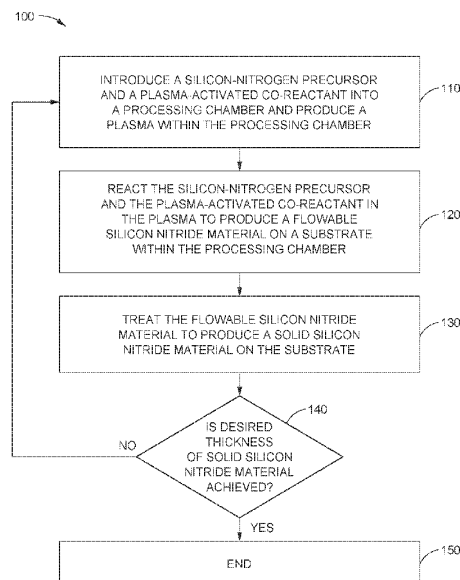


FIG. 1

(57) Abstract: Embodiments described and discussed herein provide methods for depositing silicon nitride materials by vapor deposition, such as by flowable chemical vapor deposition (FCVD), as well as for utilizing new silicon-nitrogen precursors for such deposition processes. The silicon nitride materials are deposited on substrates for gap fill applications, such as filling trenches formed in the substrate surfaces. In one or more embodiments, the method for depositing a silicon nitride film includes introducing one or more silicon-nitrogen precursors and one or more plasma-activated co-reactants into a processing chamber, producing a plasma within the processing chamber, and reacting the silicon-nitrogen precursor and the plasma-activated co-reactant in the plasma to produce a flowable silicon nitride material on a substrate within the processing chamber. The method also includes treating the flowable silicon nitride material to produce a solid silicon nitride material on the substrate.

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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))*