

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
27 May 2022 (27.05.2022)



(10) International Publication Number
WO 2022/109016 A1

(51) International Patent Classification:

H01L 21/311 (2006.01) H01L 21/768 (2006.01)
H01J 37/32 (2006.01)

(21) International Application Number:

PCT/US2021/059712

(22) International Filing Date:

17 November 2021 (17.11.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

17/100,141 20 November 2020 (20.11.2020) US

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

(72) Inventors: **CUI, Zhenjiang**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **REDDY, Rohan Puligoru**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **WANG, Anchuan**; 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(74) Agent: **MCCORMICK, Daniel K.** et al.; Kilpatrick Townsend & Stockton LLP, 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, 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, IT, 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, 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, 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, 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: SYSTEMS AND METHODS FOR TUNGSTEN-CONTAINING FILM REMOVAL

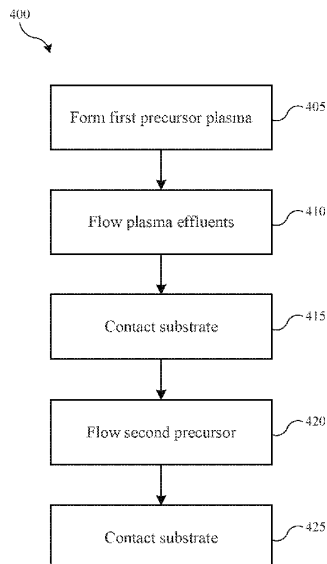


FIG. 4

(57) Abstract: Exemplary etching methods may include flowing a halogen-containing precursor into a remote plasma region of a semiconductor processing chamber while striking a plasma to produce plasma effluents. The methods may include contacting a substrate housed in a processing region with the plasma effluents. The substrate may define an exposed region of tungsten oxide. The contacting may produce a tungsten oxy-fluoride material. The methods may include flowing an etchant precursor into the processing region. The methods may include contacting the tungsten oxy-fluoride material with the etchant precursor. The methods may include removing the tungsten oxy-fluoride material.

WO 2022/109016 A1