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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 August 2025 (21.08.2025)

WIPO | PCT

(10) International Publication Number
WO 2025/174787 A1

(51) International Patent Classification:
C23C 16/26 (2006.01) *C23C 16/02* (2006.01)
C23C 16/455 (2006.01) *C23C 16/52* (2006.01)
C23C 16/04 (2006.01)

(21) International Application Number:
PCT/US2025/015455

(22) International Filing Date:
12 February 2025 (12.02.2025)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/552,463 12 February 2024 (12.02.2024) US

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

(72) Inventors: **HUANG, Ruiyun**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **FENG, Jun**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **ZHANG, Yuxing**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **LIAO, Bryan**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **KANGUDE, Abhijit**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **BANSAL, Amit Kumar**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **HAN, Xinhai**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **JANAKIRAMAN, Karthik**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(74) Agent: **DOUGHERTY, Chad M.** et al.; Patterson + Sheridan LLP, 24 Greenway Plaza, Suite 1600, Houston, Texas 77046 (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,

(54) Title: HIGH DENSITY AMORPHOUS CARBON FILM WITH REDUCED HYDROGEN CONTENT

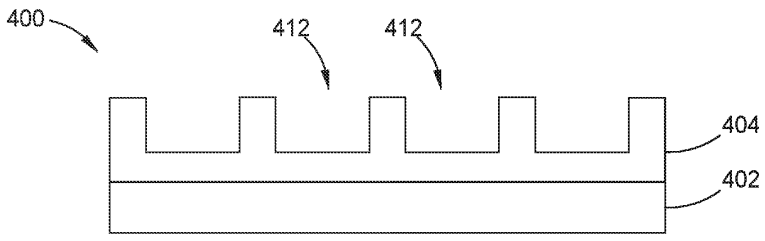


FIG. 4G

(57) Abstract: Embodiments described herein generally relate to the fabrication of integrated circuits. More particularly, the implementations described herein provide techniques for deposition of amorphous carbon films on a substrate with improved etch selectivity. In certain embodiments, a method of forming an amorphous carbon film with film density close to the theoretical density of pure sp2 graphite and reduced hydrogen content is provided.

[Continued on next page]

WO 2025/174787 A1

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))*