



(51) International Patent Classification:

H01L 21/02 (2006.01) C23C 16/34 (2006.01)
H01L 21/033 (2006.01) C23C 16/505 (2006.01)

(21) International Application Number:

PCT/US2022/030702

(22) International Filing Date:

24 May 2022 (24.05.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

17/330,013 25 May 2021 (25.05.2021) US

(71) Applicant: **APPLIED MATERIALS, INC.** [US/US];
3050 Bowers Avenue, Santa Clara, CA 95054 (US).(72) Inventors: **ZHU, Siyu**; 3050 Bowers Avenue, Santa Clara,
CA 95054 (US). **YANG, Chuanxi**; 3050 Bowers Avenue,
Santa Clara, CA 95054 (US). **YU, Hang**; 3050 Bowers Avenue,
Santa Clara, CA 95054 (US). **PADHI, Deenesh**; 3050
Bowers Avenue, Santa Clara, CA 95054 (US). **KWAK,**
Yeonju; 3050 Bowers Avenue, Santa Clara, CA 95054
(US). **KIM, Jeong Hwan**; 3050 Bowers Avenue, Santa
Clara, CA 95054 (US). **FU, Qian**; 3050 Bowers Avenue,

Santa Clara, CA 95054 (US). **YANG, Xiawan**; 3050 Bowers
Avenue, Santa Clara, CA 95054 (US).

(74) Agent: **CAMPBELL, Quinten, Moore et al.**; 1100
Peachtree Street NE, Suite 2800, Atlanta, GA 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, IQ, IR, IS, IT, JM, 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,

(54) Title: BORON NITRIDE FOR MASK PATTERNING

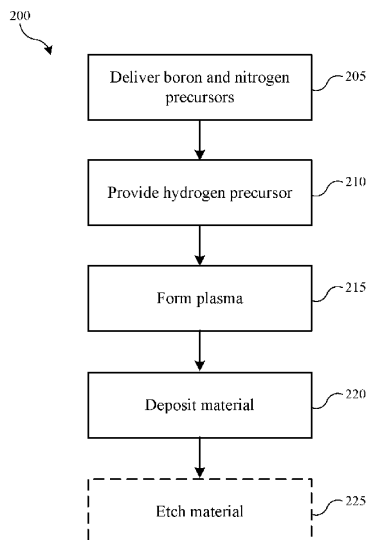


FIG. 2

(57) **Abstract:** Exemplary deposition methods may include delivering a boron-containing precursor and a nitrogen-containing precursor to a processing region of a semiconductor processing chamber. The methods may include providing a hydrogen-containing precursor with the boron-containing precursor and the nitrogen-containing precursor. A flow rate ratio of the hydrogen-containing precursor to either of the boron-containing precursor or the nitrogen-containing precursor may be greater than or about 2:1. The methods may include forming a plasma of all precursors within the processing region of the semiconductor processing chamber. The methods may include depositing a boron-and-nitrogen material on a substrate disposed within the processing region of the semiconductor processing chamber.

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))*