

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

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
21 July 2022 (21.07.2022)



(10) International Publication Number
WO 2022/155090 A1

(51) International Patent Classification:

C07F 11/00 (2006.01) C23C 16/455 (2006.01)

C23C 16/18 (2006.01)

(21) International Application Number:

PCT/US2022/011797

(22) International Filing Date:

10 January 2022 (10.01.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

17/146,878 12 January 2021 (12.01.2021) US

(71) Applicants: **APPLIED MATERIALS, INC.** [US/US];

3050 Bowers Avenue, Santa Clara, California 95054 (US).

NATIONAL UNIVERSITY OF SINGAPORE [SG/SG];

21 Lower Kent Ridge Road, Singapore 119077 (SG).

(72) Inventors: **LEONCINI, Andrea**; **APPLIED**

MATERIALS SINGAPORE TECHNOLOGY PTE LTD,

10 Science Park Road, #02-03, The Alpha Science Park II,

Singapore 117684 (SG). **MEHLMANN, Paul**; **NATION-**

AL UNIVERSITY OF SINGAPORE, 21 Lower Kent Ridge

Road, Singapore 119077 (SG). **DORDEVIC, Nemanja**;

NATIONAL UNIVERSITY OF SINGAPORE, 21 Lower

Kent Ridge Road, Singapore 119077 (SG). **HUYNH, Han**

Vinh; **NATIONAL UNIVERSITY OF SINGAPORE**, 21

Lower Kent Ridge Road, Singapore 119077 (SG). **YONG,**

Doreen Wei Ying; **APPLIED MATERIALS SINGAPORE**

TECHNOLOGY PTE LTD, 10 Science Park Road, #02-03,

The Alpha Science Park II, Singapore 117684 (SG). **SALY,**

Mark; **APPLIED MATERIALS, INC.**, 3050 Bowers

Avenue, Santa Clara, California 95054 (US). **BHUYAN,**

Bhaskar Jyoti; **APPLIED MATERIALS, INC.**, 3050 Bow-

ers Avenue, Santa Clara, California 95054 (US).

(74) Agent: **WRIGHT, Jonathan B.**; **SERVILLA WHITNEY**

LLC, 33 Wood Avenue South, Suite 830, Iselin, New Jersey

08830 (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: MOLYBDENUM (0) PRECURSORS FOR DEPOSITION OF MOLYBDENUM FILMS

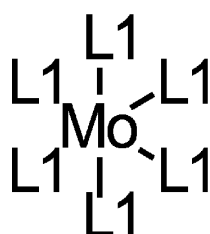


FIG. 2A

(57) Abstract: Molybdenum(0) coordination complexes comprising ligands which each coordinate to the metal center by nitrogen or phosphorous are described. Methods for depositing molybdenum-containing films on a substrate are described. The substrate is exposed to a molybdenum precursor and a reactant to form the molybdenum-containing film (e.g., elemental molybdenum, molybdenum oxide, molybdenum carbide, molybdenum silicide, molybdenum nitride). The exposures can be sequential or simultaneous.

WO 2022/155090 A1