

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
14 November 2024 (14.11.2024)



(10) International Publication Number
WO 2024/233437 A1

(51) International Patent Classification:
H01L 21/3213 (2006.01)

SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(21) International Application Number:
PCT/US2024/027941

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(22) International Filing Date:
06 May 2024 (06.05.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/501,404 11 May 2023 (11.05.2023) US

(71) Applicant: **VERSUM MATERIALS US, LLC** [US/US];
8555 South River Parkway, Tempe, Arizona 85284 (US).

(72) Inventors: **CAO, Yuanmei**; c/o Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (US). **SUN, Laisheng**; c/o Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (US). **PEJLOVAS, Aaron**; c/o Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (US). **GE, Jhih-Kuei**; c/o Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (US). **WU, Aiping**; c/o Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (US).

(74) Agent: **SLAVEN IV, William T.**; Versum Materials US, LLC, 8555 South River Parkway, Tempe, Arizona 85284 (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, 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, 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,

(54) Title: COMPOSITION FOR TIN HARD MASK REMOVAL WHILE COMPATIBLE WITH TUNGSTEN

(57) Abstract: Composition, method and system for TiN hard mask removal from electronic circuitry devices, such as advanced pattern wafers, have been disclosed. The etching formulations include, consist essentially of or consist of (a) at least one phosphorous containing acid or salt thereof, (b) at least one oxidizing agent, (c) at least one at least one cationic polymer corrosion inhibitor and (d) at least one solvent.

WO 2024/233437 A1