

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
07 March 2019 (07.03.2019)



(10) International Publication Number
WO 2019/046449 A1

(51) International Patent Classification:

C23C 16/40 (2006.01) C23C 16/01 (2006.01)
C23C 16/448 (2006.01) C23C 16/02 (2006.01)
C23C 16/56 (2006.01) H01L 21/02 (2006.01)
C23C 16/50 (2006.01)

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).

(21) International Application Number:

PCT/US2018/048580

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

(22) International Filing Date:

29 August 2018 (29.08.2018)

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))

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/552,040 30 August 2017 (30.08.2017) US

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

(72) Inventors: **RIDGEWAY, Robert, Gordon**; 8555 S. River Parkway, Tempe, AZ 85284 (US). **VRTIS, Raymond, Nicholas**; 8555 S. River Parkway, Tempe, AZ 85284 (US). **LEI, Xinjian**; 8555 S. River Parkway, Tempe, AZ 85284 (US). **ACHTYL, Jennifer, Lynn Anne**; 8555 S. River Parkway, Tempe, AZ 85284 (US). **ENTLEY, William, Robert**; 8555 S. River Parkway, Tempe, AZ 85284 (US).

(74) Agent: **ROSSI, Joseph, D.** et al.; Stradley Ronon Stevens & Young, LLP, 30 Valley Stream Parkway, Great Valley Corporate Center, Malvern, PA 19355 (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, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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,

(54) Title: ALKOXYLSILACYCLIC OR ACYLOXYLSILACYCLIC COMPOUNDS AND METHODS FOR DEPOSITING FILMS USING SAME

(57) Abstract: A method and composition for producing a porous low k dielectric film via chemical vapor deposition is provided. In one aspect, the method comprises the steps of: providing a substrate within a reaction chamber; introducing into the reaction chamber gaseous reagents including at least one structure-forming precursor comprising a alkoxy silacyclic or acyloxy silacyclic compound with or without a porogen; applying energy to the gaseous reagents in the reaction chamber to induce reaction of the gaseous reagents to deposit a preliminary film on the substrate, wherein the preliminary film contains the porogen, and the preliminary film is deposited; and removing from the preliminary film at least a portion of the porogen contained therein and provide the film with pores and a dielectric constant of 3.2 or less. In certain embodiments, the structure-forming precursor further comprises a hardening additive.



WO 2019/046449 A1