

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

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
23 November 2023 (23.11.2023)



(10) International Publication Number
WO 2023/224563 A1

(51) International Patent Classification:

C08L 1/28 (2006.01) B32B 23/04 (2006.01)
C01B 32/198 (2017.01) C02F 1/00 (2023.01)

(21) International Application Number:

PCT/SG2023/050350

(22) International Filing Date:

20 May 2023 (20.05.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

10202205367T 20 May 2022 (20.05.2022) SG

(71) Applicant: NATIONAL UNIVERSITY OF SINGAPORE [SG/SG]; 21 Lower Kent Ridge Road, Singapore 119077 (SG).

(72) Inventors: ANDREEVA-BAEUMLER, Daria; c/o National University of Singapore, College of Design and Engineering, Department of Materials Science and Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG). NOVOSELOV, Konstantin; c/o National University of Singapore, College of Design and Engineering, Department of Materials Science and Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG). YANG, Kou; c/o National University of Singapore, College of Design and Engineering, Department of Materials Science and Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG).

(74) Agent: PATEL, Upasana; Marks & Clerk Singapore LLP, Tanjong Pagar Post Office, P.O. Box 636, Singapore 910816 (SG).

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

Declarations under Rule 4.17:

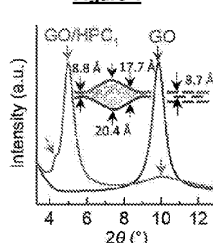
— of inventorship (Rule 4.17(iv))

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))

(54) Title: A GRAPHENE OXIDE-THERMORESPONSIVE POLYMER COMPOSITE FILM

Figure 4



(57) Abstract: A graphene oxide-thermoreponsive polymer composite film There is provided a two-dimensional (2D) graphene oxide-thermoreponsive polymer composite film comprising: at least two graphene oxide (GO) layers; and a thermoresponsive polymer layer between each GO layer, wherein the thermoresponsive polymer layer switches between being aligned and being disoriented between the at least two GO layers when temperature of the composite film changes from being below lower critical solution temperature (LCST) of the thermoresponsive polymer comprised in the composite film to being above the LCST of the thermoresponsive polymer. There is also provided a method of forming the composite film.

WO 2023/224563 A1