

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
27 October 2022 (27.10.2022)



(10) International Publication Number
WO 2022/223670 A1

(51) International Patent Classification:

C08F 297/02 (2006.01) C09D 153/00 (2006.01)
C08F 212/32 (2006.01) G03F 7/00 (2006.01)
B82Y 40/00 (2011.01) H01L 21/00 (2006.01)

(21) International Application Number:

PCT/EP2022/060506

(22) International Filing Date:

21 April 2022 (21.04.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/178,612 23 April 2021 (23.04.2021) US

(71) Applicant: **MERCK PATENT GMBH** [DE/DE]; Frankfurter Straße 250, 64293 Darmstadt (DE).

(72) Inventors: **RAHMAN, Md S.**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US). **BASKARAN, Durairaj**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US). **LI, Jin**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US). **BOBADE, Sachin**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US). **JEONG, EunJeong**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US). **LI, Zhong**; c/o EMD Performance Materials Corp., 70 Meister Avenue, Branchburg, New Jersey 08876 (US).

(74) Agent: **RIPPEL, Hans Christoph**; Patentanwälte Isenbruck Bösl Hörschler PartG mbB, Seckenheimer Landstraße 4, 68163 Mannheim (DE).

(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, 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, 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))
- 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: MULTI-PITCH TOLERABLE BLOCK COPOLYMERS WITH ENHANCED KINETICS FOR DIRECTED SELF-ASSEMBLY APPLICATIONS

(57) Abstract: The present invention relates to two different block copolymer families having structures (1) or (6) which both have a polydispersity ranging from 1 to about 1.09. In structure (1), A is a polar block copolymer segment comprised of either alkyl 2-methylenealkanoate derived repeating units, lactone derived repeat units, oxirane derived repeat units, oxetane or cyclic carbonate derived repeat units; L is either a direct valence bond or a linking moiety derived from a 1, 1-diarylethene; B segment is a non-polar block copolymer segment comprised of styrenic repeat unit, E are end groups selected; and wherein said block copolymer is multi-tethered with oligo flexible tethered groups at various positions as outlined. In structure (6), A_i is a polar block copolymer segment which has T_g of about 50°C and to about 100°C; comprised of alkyl 2-methylenealkanoate derived repeating units, lactone derived repeat units, oxirane derived repeat units, oxetane or cyclic carbonate derived repeat units; B_i is a styrenic block copolymer segment, which has a T_g from about 50°C and to about 100°C, B₂ is a block copolymer segment with a T_g ranging from about -5°C to about -50°C. The present invention also pertains to compositions comprising either the block copolymer having structures (1) or the block copolymer having structure (6) and to methods of using these compositions. E-A-L-B-L-A-E (1) E₁-A₁-L₁-B₂-B₁-B₂-L₁-A₁-E₁(6)

WO 2022/223670 A1