

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

(19) World Intellectual Property  
Organization  
International Bureau

(43) International Publication Date  
22 February 2024 (22.02.2024)



(10) International Publication Number  
**WO 2024/038007 A1**

(51) International Patent Classification:

*C08F 293/00* (2006.01) *H01L 21/00* (2006.01)  
*B82Y 40/00* (2011.01) *C08F 212/08* (2006.01)  
*C08F 297/02* (2006.01) *C08F 212/12* (2006.01)  
*C09D 153/00* (2006.01) *C08F 220/14* (2006.01)  
*G03F 7/00* (2006.01) *C08F 220/18* (2006.01)

(21) International Application Number:

PCT/EP2023/072371

(22) International Filing Date:

14 August 2023 (14.08.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/371,585 16 August 2022 (16.08.2022) US

(71) Applicant: **MERCK PATENT GMBH** [DE/DE]; Frankfurt  
furter StraÙe 250, 64293 Darmstadt (DE).

(72) Inventors: **BASKARAN, Durairaj**; c/o EMD Performance  
Materials Corp., 70 Meister Avenue, Branchburg,  
New Jersey 08876 (US). **RAHMAN, Md S**; c/o EMD Performance  
Materials Corp., 70 Meister Avenue, Branchburg,  
New Jersey 08876 (US). **MONREAL, Victor**; c/o EMD  
Performance Materials Corp., 70 Meister Avenue, Branch-  
burg, New Jersey 08876 (US).

(74) Agent: **RIPPEL, Hans Christoph**; Patentanwälte Isen-  
bruck Bösl Hörschler PartG mbB, Seckenheimer Land-  
straÙe 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, 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).

Published:

— with international search report (Art. 21(3))

(54) Title: LOW TGMULTI-TETHER COPOLYMERIZED DIBLOCK COPOLYMERS FOR DIRECTED SELF-ASSEMBLY

(57) Abstract: Disclosed are two different block copolymer families having general structures (I) or (III), composition thereof, and the process of using these compositions for DSA; wherein B segment and B<sub>1</sub> segment are polar block copolymer segments comprising either alkyl 2-methylenealkanoate derived repeating units, lactone derived repeat units, oxirane derived repeat units, oxetane or cyclic carbonate derived repeat units; L and L<sub>1</sub> are either a direct valence bond or a linking moiety derived from a 1,1-diarylethene; A segment and A<sub>1</sub> are non-polar block copolymer segment comprising styrenic repeat unit, E', E" E<sup>3</sup> and E<sup>4</sup> are different types of end groups, A<sub>2</sub> is a block segment derived from an olefin or a diene having a T<sub>g</sub> of about -5°C to about -50°C, and in structure (I) is multi-tethered with oligo flexible tethered groups at various positions as outlined. E'-A-L-B-E" (I) E<sup>3</sup>-A<sub>1</sub>-A<sub>2</sub>-L<sub>1</sub>-B<sub>1</sub>-E<sup>4</sup> (III)



WO 2024/038007 A1