

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

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 January 2012 (12.01.2012)

(10) International Publication Number
WO 2012/005698 A1

PCT

(51) International Patent Classification:

C08G 65/48 (2006.01) **B01D 71/70** (2006.01)
C08G 81/00 (2006.01) **B01D 71/52** (2006.01)
C08G 73/02 (2006.01) **B01D 71/78** (2006.01)
B01D 71/00 (2006.01)

(21) International Application Number:

PCT/SG2011/000246

(22) International Filing Date:

8 July 2011 (08.07.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/362,948 9 July 2010 (09.07.2010) US

(71) Applicant (for all designated States except US): **NATIONAL UNIVERSITY OF SINGAPORE** [SG/SG];
21 Lower Kent Ridge Road, Singapore 119077 (SG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LAU, Cher-Hon** [SG/SG]; c/o National University of Singapore, Faculty of Engineering, Department of Chemical and Biomolecular Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG). **CHUNG, Tai-Shung** [US/SG]; c/o National University of Singapore, Faculty of Engineering, Department of Chemical and Biomolecular Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG). **LIU, Songlin** [CN/SG]; c/o National University of Singapore, Faculty of Engineering, Department of Chemical and Biomolecular Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG). **SHAO, Lu** [CN/SG]; c/o National University of Singapore, Faculty of Engineering, Department of Chemical and Biomolecular Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG).

XIA, Jianzhong [CN/SG]; c/o National University of Singapore, Faculty of Engineering, Department of Chemical and Biomolecular Engineering, 21 Lower Kent Ridge Road, Singapore 119077 (SG).

(74) Agent: **AMICA LAW LLC**; 30 Raffles Place, #18-03/04 Chevron House, Singapore 048622 (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, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, 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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, 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, 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))

(54) Title: ULTRA-PERMEABLE MEMBRANES FOR GAS SEPARATION

(57) Abstract: This invention relates to a monomer including (i) a poly(alkylene) oxide backbone having 20 to 1000 carbon atoms and 10 to 500 oxygen atoms, the carbon/oxygen ratio being 1:1 to 10:1; (ii) one to one hundred poly(alkylene) oxide side chains attached to the backbone, wherein each chain has 10 to 500 carbon atoms and 5 to 250 oxygen atoms, the carbon/oxygen ratio being 1:1 to 10:1; and (iii) one to eight cross-linking groups also attached to the backbone, each cross linking group having two to four binding moieties. This monomer is capable of cross-linking other monomers having the same structural features to form a polymer via its binding moieties and the binding moieties of the other monomers. The thus-formed polymer has increased permeability for H₂ and CO₂ and selectively for the gas pair CO₂/H₂.



WO 2012/005698 A1