

Supplementary Material

Design of ionic liquid-derived polyelectrolyte gels toward reversible water absorption/desorption system driven by small temperature changeYuki Deguchi,^{AB} Yuki Kohno,^{AB} and Hiroyuki Ohno^{*AB}^ADepartment of Biotechnology, Tokyo University of Agriculture and Technology,
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¹H NMR of IL monomers[P₄₄₄₆][MC3S]¹H NMR (400 MHz, CDCl₃, δ / ppm relative to TMS): 0.90 (t, *J* 2.29, 3H, CH₂CH₃), 0.97 (t, *J* 6.86, 9H, CH₂CH₃), 1.31-1.32 (m, 4H, CH₂CH₂), 1.51-1.56 (m, 16H, CH₂CH₂), 1.92 (t, 3H, CCH₃), 2.19-2.38 (m, 10H, PCH₂, CH₂CH₂), 2.89-2.93 (m, 2H, SO₃CH₂), 4.26 (t, , *J* 6.52 2H, OCH₂), 5.52 (dd, 1H, CCH), 6.08 (dd, 1H, CCH).[P₄₄₄₈][MC3S]¹H NMR (400 MHz, CDCl₃, δ / ppm relative to TMS): 0.80 (t, *J* 8, 3H, CH₂CH₃), 0.98 (t, *J* 8, 9H, CH₂CH₃), 1.27 (m, 8H, CH₂CH₂), 1.53 (t, *J* 4, 16H, CH₂CH₂), 1.92 (s, 3H, CCH₃), 2.19-2.38 (m, 10H, PCH₂, CH₂CH₂), 2.91 (t, *J* 8, 2H, SO₃CH₂), 4.26 (t, *J* 6, 2H, OCH₂), 5.52 (dd, 1H, CCH), 6.08 (dd, 1H, CCH).

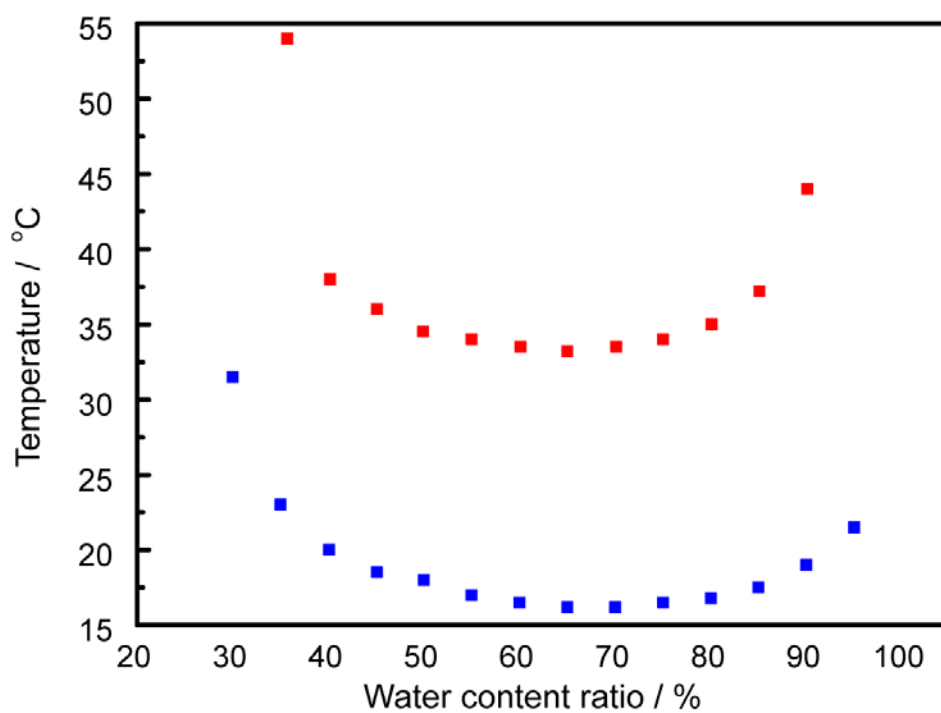


Fig. S1. Phase transition temperature (T_c) of [P₄₄₄₆][MC3S] (red) and [P₄₄₄₈][MC3S] (blue) after mixing with different amounts of water.

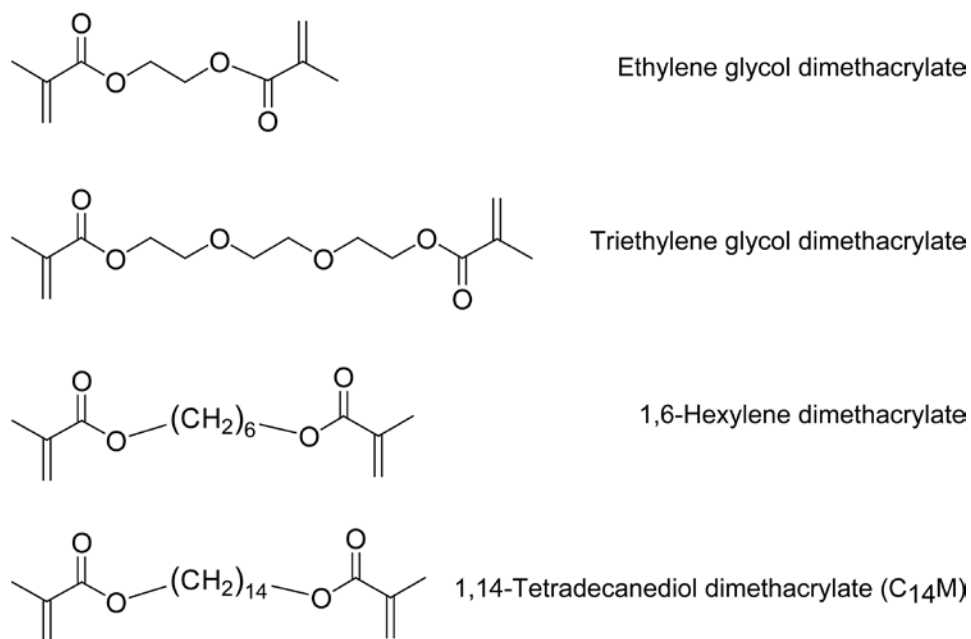


Fig. S2. Structure of cross-linkers used in this study.

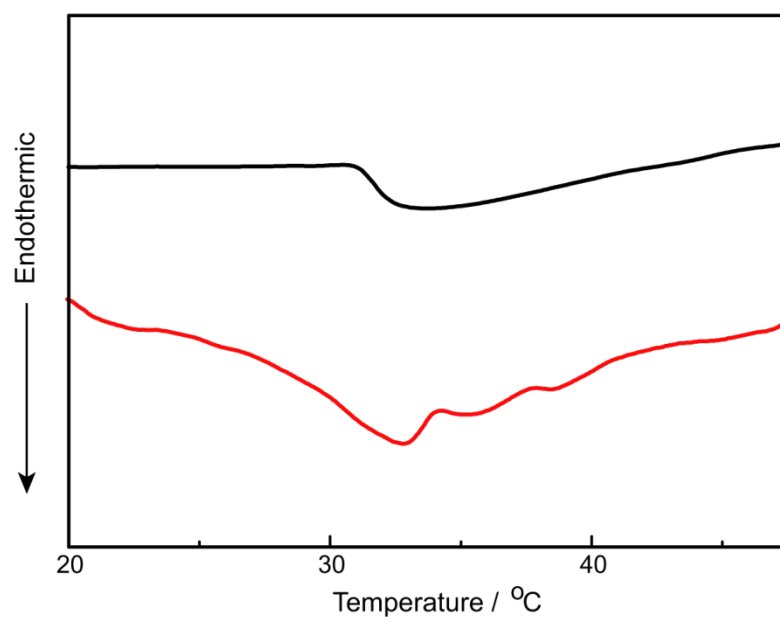


Fig. S3. Endothermic peak of poly(IL)s; black line: linear poly(IL), and red line: poly(IL) gel. The x value was 0.4.

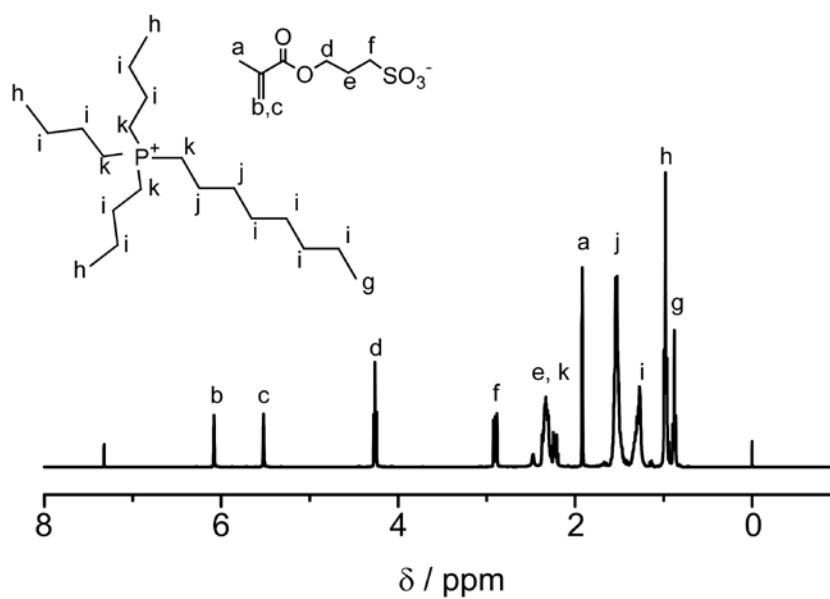


Fig. S4. ^1H NMR chart of $[\text{P}_{4448}][\text{MC3S}]$ monomer in CDCl_3 .

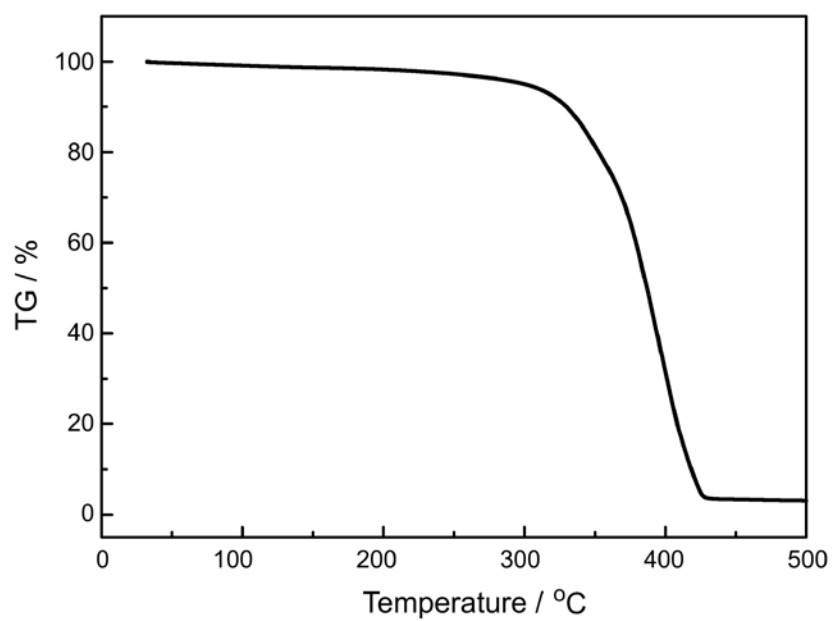


Fig. S5. TG/DTA chart of $[P_{4448}][MC3S]$ monomer.

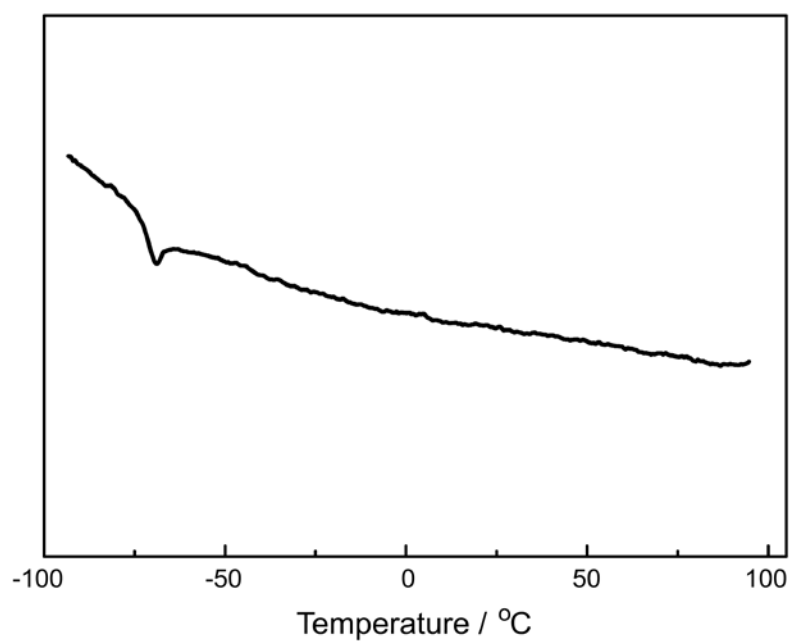


Fig. S6. DSC chart of $[P_{4448}][MC3S]$ monomer.

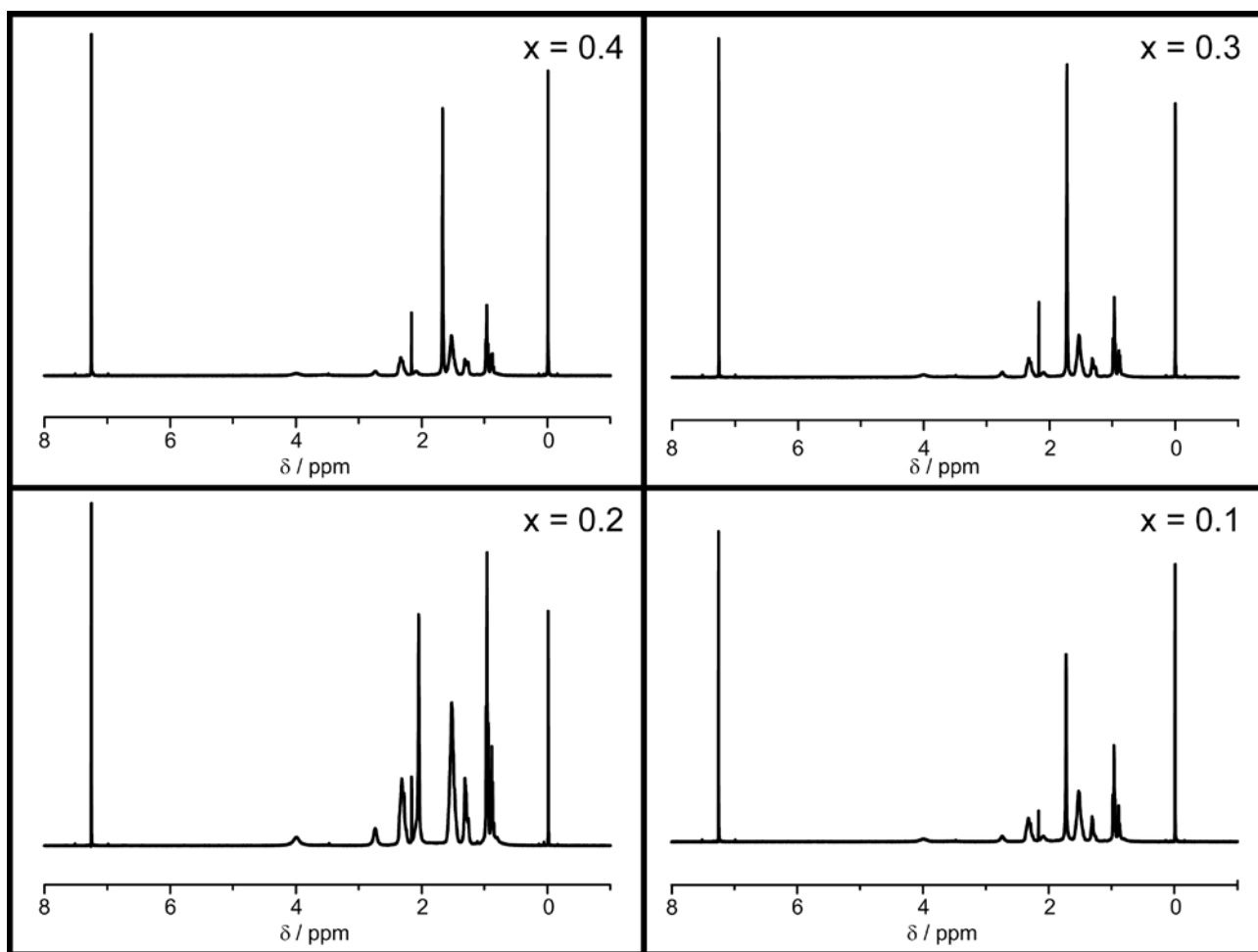


Fig. S7. ^1H NMR charts of poly($([\text{P}_{4448}][\text{MC3S}])_x\text{-co-}([\text{P}_{4446}][\text{MC3S}])_{1-x}$) in CDCl_3 .

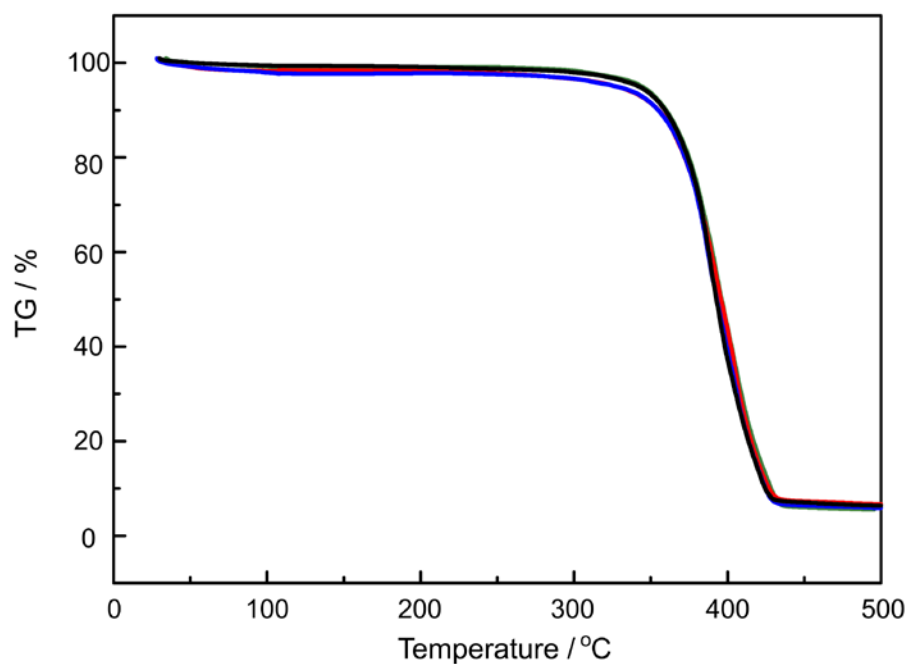


Fig. S8. TG/DTA charts of poly(($[P_{4448}][MC3S]_x$ -co- $([P_{4446}][MC3S]_{1-x})$). The x value is 0.1(red), 0.2(green), 0.3(blue), and 0.4(black), respectively.

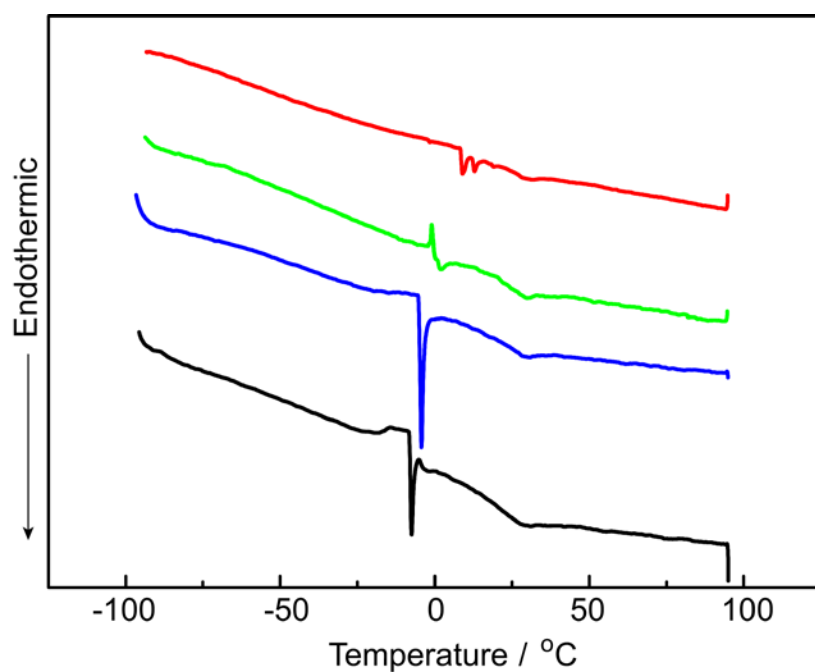


Fig. S9. DSC charts of poly(($[P_{4448}][MC3S]_x$ -co- $([P_{4446}][MC3S]_{1-x})$). The x value is 0.1(red), 0.2(green), 0.3(blue), and 0.4(black), respectively.

Table S1. M_w , M_n , and PDI values of poly($([P_{4448}][MC3S])_x-co-([P_{4446}][MC3S])_{1-x}$) determined by GPC measurement.

x	M_w	M_n	M_w/M_n
0.1	2.4×10^5	8.0×10^5	3.4
0.2	1.5×10^5	8.1×10^5	5.3
0.3	2.5×10^5	1.3×10^6	5.1
0.4	2.3×10^5	1.0×10^6	4.4

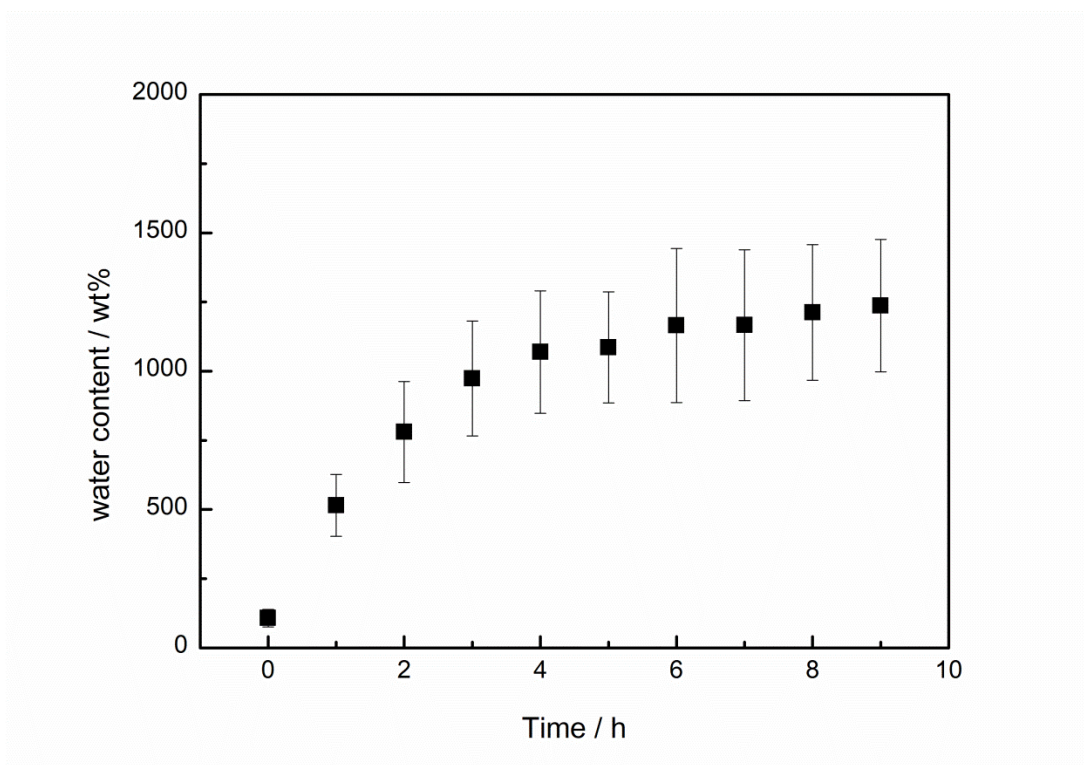


Fig. S10. Change of water content of poly(IL)_{x=0.4} gel with time.

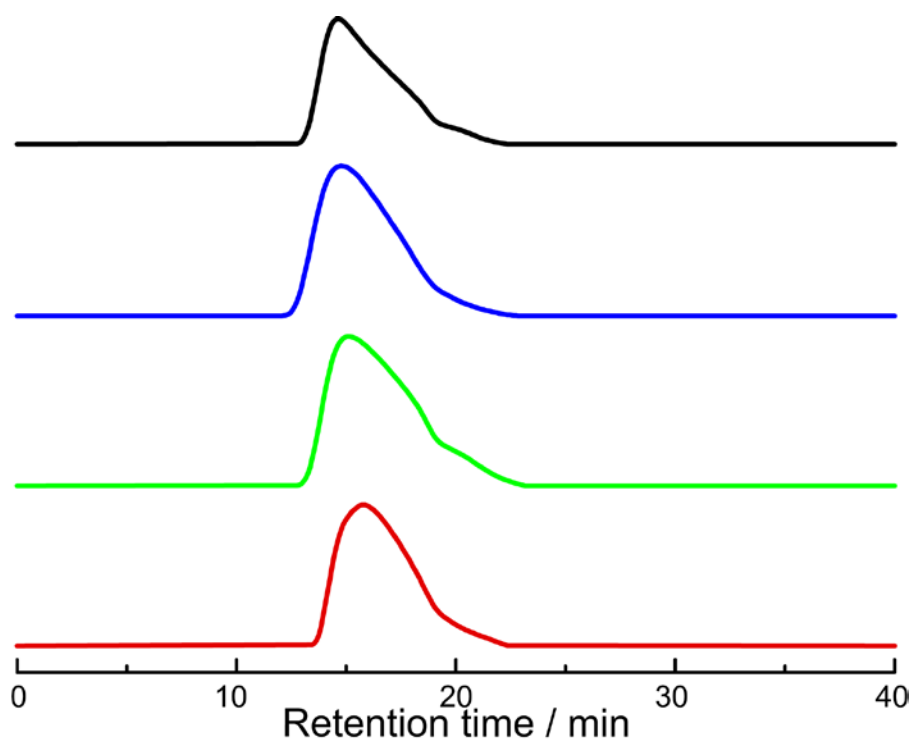


Fig. S11. GPC charts of poly($([P_{4448}][MC3S])_x-co-(P_{4446}][MC3S])_{1-x}$). The x value of the poly(IL)s was 0.1(red), 0.2(green), 0.3(blue), and 0.4(black), respectively.