
Supporting Information for

**Ionic Conductivity, Capacitance, and Viscoelastic Properties of
Block Copolymer-Based Ion Gels**

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Table S1. Vogel-Fulcher-Tammann (VFT) Fitting Parameters of Ionic Conductivity for the Ion Gels.

$$\sigma = \sigma_0 \exp[-B/(T-T_0)]$$

| Polymer Content (wt%) | σ_0 (mS/cm) | B (K) | T_0 (K) |
|-----------------------|--------------------|--------------|-------------|
| 10-SMS | 246 ± 15 | 416 ± 18 | 189 ± 3 |
| 20-SMS | 299 ± 29 | 717 ± 43 | 161 ± 6 |
| 30-SMS | 298 ± 21 | 873 ± 32 | 164 ± 4 |
| 40-SMS | 231 ± 7 | 847 ± 12 | 184 ± 1 |
| 50-SMS | 272 ± 6 | 1045 ± 9 | 186 ± 8 |
| 10-SOS | 325 ± 31 | 451 ± 28 | 186 ± 4 |
| 20-SOS | 210 ± 27 | 494 ± 47 | 183 ± 8 |
| 30-SOS | 164 ± 14 | 457 ± 29 | 201 ± 5 |
| 40-SOS | 137 ± 11 | 458 ± 26 | 208 ± 4 |
| 50-SOS | 71 ± 4 | 370 ± 16 | 223 ± 3 |

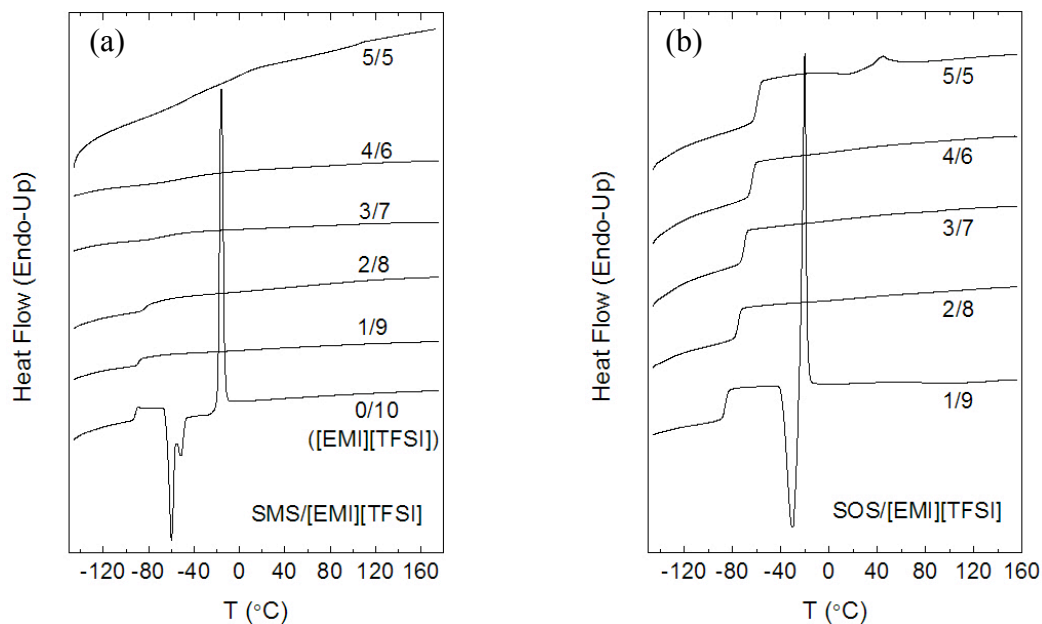


Figure S1. DSC thermograms of (a) [EMI][TFSI] and SMS/[EMI][TFSI] ion gels and (b) SOS/[EMI][TFSI] ion gels with different weight fractions of polymer. Thermal transitions were measured using TA Instruments Q1000 Differential Scanning Calorimeter (DSC). Samples in (a) and (b) weighing $\sim 5 - 10$ mg were sealed in hermetic aluminum pans, heated up to 180 $^{\circ}\text{C}$ and 160 $^{\circ}\text{C}$, respectively, cooled rapidly to -150 $^{\circ}\text{C}$, and then heated back up at 10 $^{\circ}\text{C}/\text{min}$. The heating rate for the ion gel with 50 wt% SMS was 20 $^{\circ}\text{C}/\text{min}$. The thermograms shown were taken from the second heating cycle, from which the glass transition temperatures were measured using the mid-point method.

Table S2. Glass Transition Temperatures (T_g) and Associated Transition Ranges for [EMI][TFSI] and the Ion Gels.

| Polymer Content (wt%) | T_g (°C) | Transition Range (°C) | ΔT_g |
|-----------------------|------------|-----------------------|--------------|
| 0 | −91 | −96 ~ −89 | 7 |
| 10-SMS | −88 | −95 ~ −58 | 37 |
| 20-SMS | −84 | −92 ~ −40 | 52 |
| 30-SMS | −69 | −89 ~ −20 | 69 |
| 40-SMS | −54 | −83 ~ −6 | 77 |
| 50-SMS ^a | −47, 3 | −81 ~ −23, −16 ~ 20 | 51, 36 |
| 10-SOS | −86 | −91 ~ −81 | 10 |
| 20-SOS | −75 | −88 ~ −66 | 22 |
| 30-SOS | −70 | −83 ~ −63 | 20 |
| 40-SOS | −64 | −78 ~ −52 | 26 |
| 50-SOS | −60 | −79 ~ −49 | 30 |

^a Heating rate is 20 °C/min.

Table S3. Williams-Landel-Ferry (WLF) Fitting Parameters of Shift Factors (a_T) for PMMA/[EMI][TFSI] Solutions.

$$\log a_T = -C_1(T - T_{\text{ref}})/(C_2 + T - T_{\text{ref}})$$

| PMMA (wt%) | C_1 | C_2 (°C) | T_{ref} (°C) |
|------------|-----------------|-------------|-----------------------|
| 10 | 4.85 ± 0.19 | 126 ± 3 | 0 |
| 20 | 3.68 ± 0.08 | 177 ± 2 | 70 |
| 30 | 4.73 ± 0.20 | 262 ± 6 | 150 |
| 40 | 6.28 ± 0.33 | 242 ± 8 | 140 |

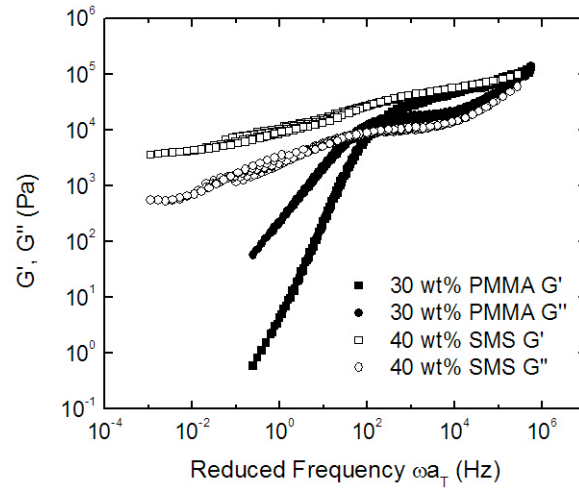


Figure S2. TTS master curves for dynamic storage and loss moduli of PMMA/[EMI][TFSI] solution with 30 wt% PMMA(126) and SMS/[EMI][TFSI] ion gel with 40 wt% SMS(18-86-18). PMMA concentration in the ion gel is 28 wt%. All curves are referenced to 120 °C.