

Supplementary Information for

Viscoelastic Relaxation of Polymerized Ionic Liquid and Lithium Salt Mixtures: Effect of Salt Concentration

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1. Van Gorp-Palmen-Plot

For the verification of the time-temperature superposition principle, we plotted the phase angle δ of the measured rheological data against the corresponding absolute value of the complex shear modulus G^* , so-called van Gorp-Palmen-plot, for all the w_{LiTFSI} mixtures. The data measured at various temperatures converge in a single curve indicating the validity of the time-temperature superposition principle.

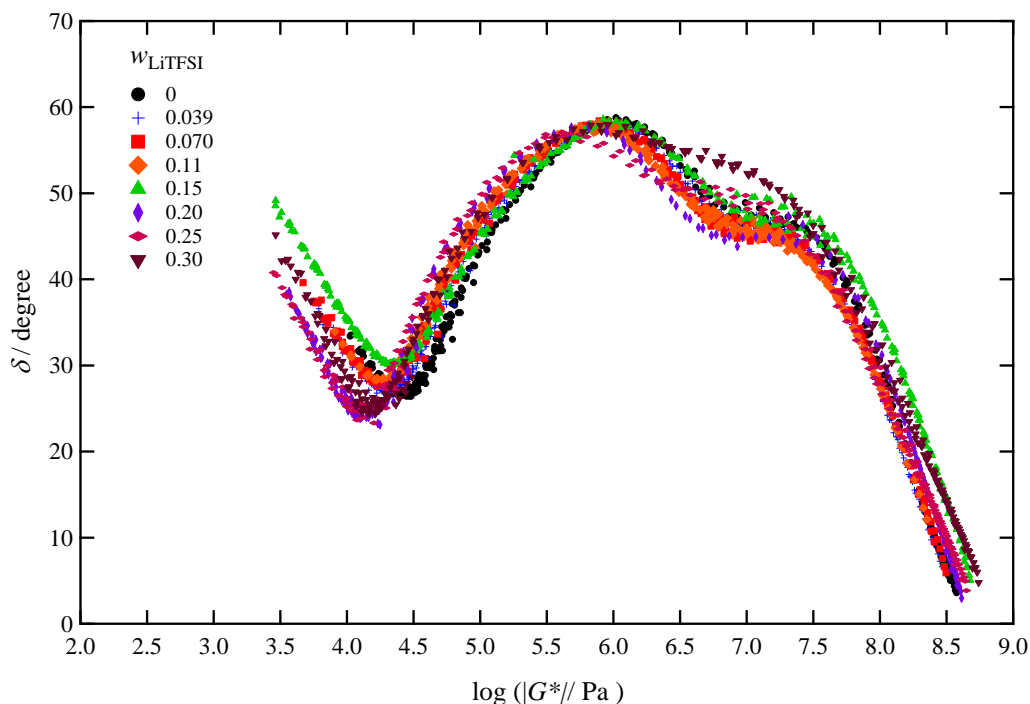


Figure S1 Van Gorp-Palmen plot for PC₄-TFSI / LiTFSI mixtures with $w_{\text{LiTFSI}} \leq 0.3$.

2. Vertical shift factors

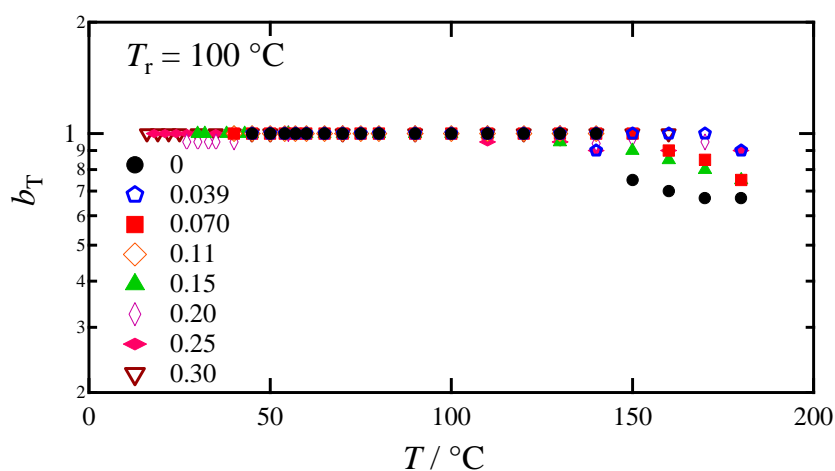


Figure S2 Temperature dependence of the vertical shift factor b_T for PC₄-TFSI / LiTFSI mixtures with $w_{\text{LiTFSI}} \leq 0.3$ at the reference temperature, 100°C.

3. Failure of Time-Temperature Superposition Principle

For the inhomogeneous mixtures ($w_{\text{LiTFSI}} = 0.35$ and 0.40), the time-temperature superposition principle (tTS) fails. Figure S2(a) shows the master curves of G^* and $\tan \delta$ constructed using only the superposable part. The tTS holds for the high-temperature and low-frequency data but fails for the low-temperature and high-frequency data (especially in the $\tan \delta$ data). Figure S2(b) displays van Gurp-Palmen-plot, which clearly shows the failuar of tTS. These results suggest that the temperature change induced the structural change, e.g. change of the degree of crystallinity.

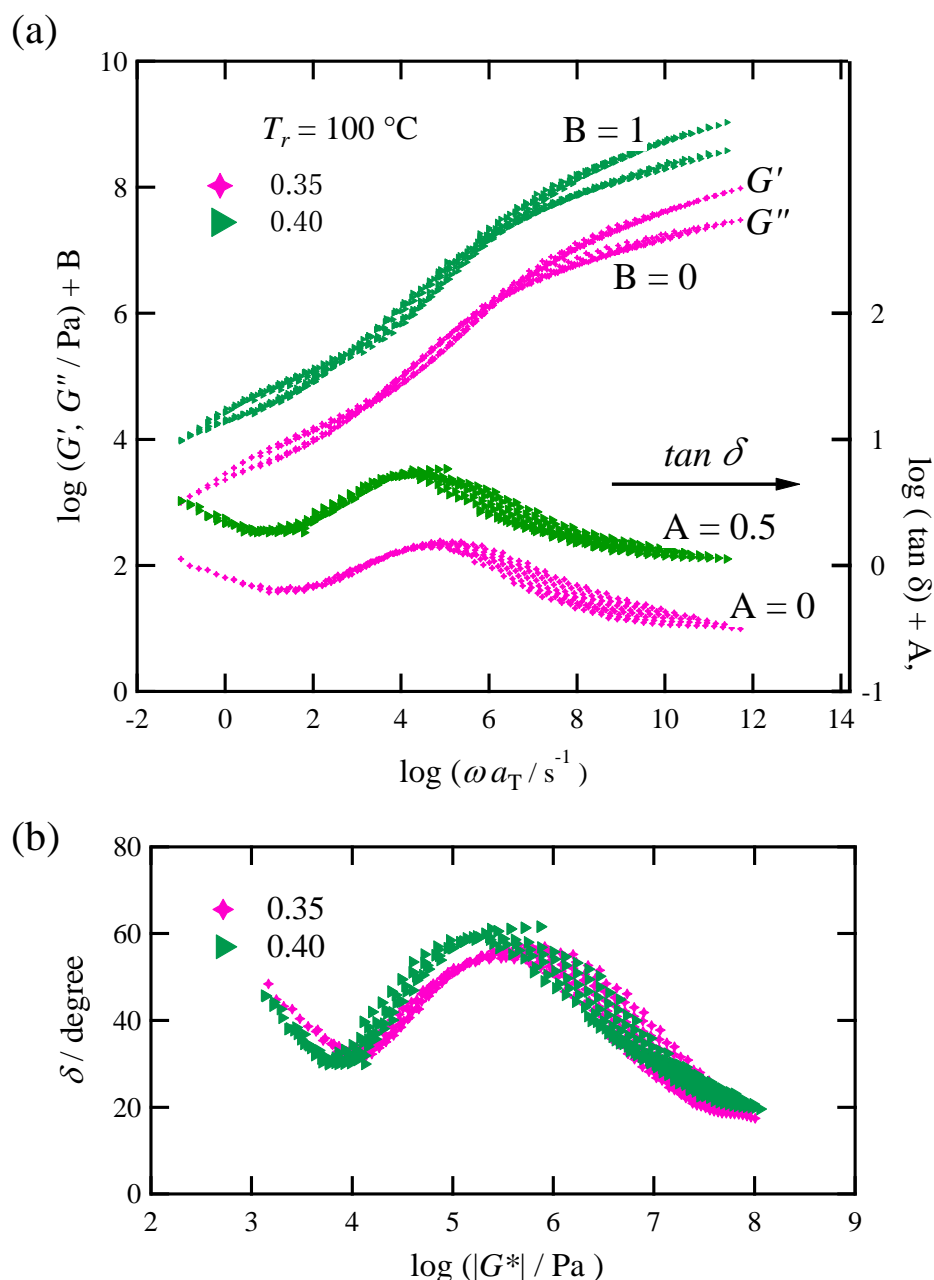


Figure S3 (a) Reduced frequency ωa_T dependence of G' , G'' and $\tan \delta$ curves at the reference temperature, 100°C , and (b) the corresponding van Gurp-Palmen-plot for PC₄-TFSI / LiTFSI mixtures with $w_{\text{LiTFSI}} = 0.35$ and 0.40