**Electronic Supplementary Information**

A study combining magic-angle spinning NMR and small-angle X-ray scattering on the interaction in the mixture of poly(benzyl methacrylate) and ionic liquid 1-ethyl-3-methylimidazolium bis(trifluoromethanesulfonyl)amide

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**Overlap concentration**

On the basis of the Guinier approximation,¹ the radius of gyration, \( R_g \), of the PBnMA chain was evaluated to be 3.6±0.1, 4.5±0.2 and 5.8±0.5 nm for the polymers with \( M_w = 18, 27 \) and 40 kDa, respectively. The Guinier plots of the SAXS profiles for the polymer with \( M_w = 18, 27 \) and 40 kDa are shown in Fig. S1. The \( R_g \) values were determined by iteration with checking the consistency between the evaluated \( R_g \) value and the appropriate \( q \)-region as determined on the basis of \( 1/R_g \). The overlap
concentrations, \( c^* \), for the polymers with \( M_w = 18, 27 \) and 40 kDa were approximately estimated to be 0.16, 0.12 and 0.080 g/mL (corresponding to \( ca. 16, 12 \) and 8.0 wt\%), respectively, using the equation
\[
c^* = \frac{3M_w}{(4\pi N_A R_g^3)}
\]
where \( N_A \) is the Avogadro’s number.\(^2,3\) Considering the estimated concentrations, the concentration studied here was sufficiently low compared with \( c^* \).

**Fig. S1:** The Guinier plots, \( \ln(I(q)) \) vs. \( q^2 \), of the SAXS profiles for PBnMA in [C\(_2\)mim][NTf\(_2\)]. Solid lines represent the determined slope for evaluation of radius of gyration, \( R_g \), using the appropriate small-angle region below \( q = 1/R_g \). Green arrows indicate the appropriate \( q \)-region as determined on the basis of \( 1/R_g \).

**Concentration dependence of radius of gyration**

Fig. S2 shows concentration dependence of the evaluated \( R_g \) for the polymer of \( M_w = 18 \) kDa. The \( R_g \) values at concentrations of 0.10, 0.25 and 1.0wt\% were evaluated using the Guinier approximation.\(^1\) Although the concentration of 1wt\% is considered as sufficiently low compared with \( c^* \), the \( R_g \) values showed concentration dependence and increased with decreasing the concentration. The tendency identified in Fig. S2 is normally observable in solution systems.\(^4\)
**Fig. S2:** Concentration dependence of $R_g$ for PBnMA with $M_w = 18$ kDa in [C$_2$ mim][NTf$_2$].

Fig. S3 shows dependence of the infinite dilution radius of gyration, $R_g(c \to 0)$, on the molecular weight. The molecular weights were set at $M_w = 18, 27, 40$ and 78 kDa.

**Fig. S3:** Dependence of $R_g(c \to 0)$ on molecular weight of PBnMA.
References