Ionic liquid-in-oil microemulsions – Supporting Information

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SANS data analysis

Background subtraction

The C_6D_{12}-T-X100 background for a sample at $\phi_{T\text{-}X100}$ = 0.39 in the deuterated solvent was determined; this is shown on Figure S1 along with the IL-free R = 0 sample for comparison purposes. Owing to the weak scattering and gentle decay, this background can be attributed to non-aggregated T-X100 monomers. This free monomer background was subtracted from all other data sets, prior to further analysis.

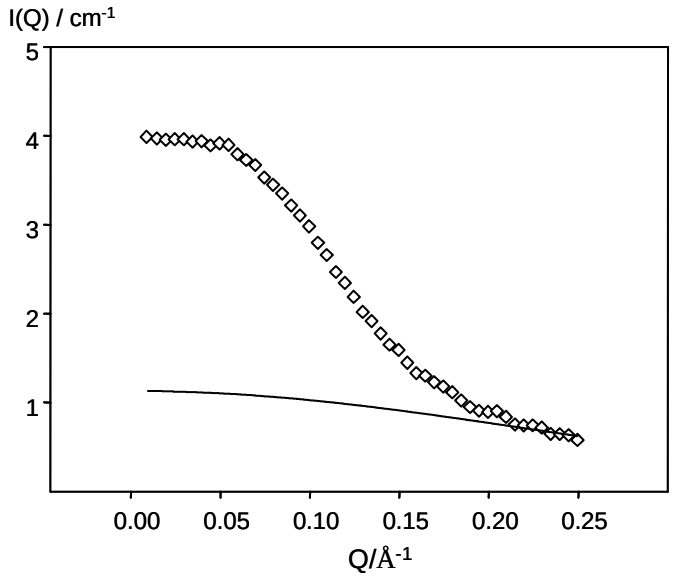

Figure S1 SANS from the R = 0 system (◇), as shown in Figure 2 of the manuscript, and the background representing non-aggregated surfactant in C_6D_{12} at a volume fraction $\phi_{T\text{-}X100}$ = 0.39 (line).

Model fitting

The subtracted data were analyzed using standard Guinier limiting laws, and the multi-model FISH fitting program [1], which is based upon an iterative least-squares algorithm. This program allowed for various common scattering laws to be tested, the best structural parameters to be obtained and also a measure of the fit residuals (sum of weighed squared errors SWSE). An approximate Q resolution function was also included. The eventual model was not arrived at randomly; instead, a strategy of eliminations was used, taking into account the general form of the scattering curves (linear and logarithmic scale) and also results from Guinier analyses.

Figure S2 shows SANS data for the R = 0.5 (= [bmim] / [T-X100]) sample, and best fits to three plausible models; monodisperse spheres, a Schulz distribution of polydisperse spheres [2, 3] and ellipsoids of revolution. This was the only sample of those described in the main manuscript, for which both physically realistic fit parameters and good quality statistical fits could be obtained for all three of these form factor models: therefore it represents the most stringent test. Analyses of the other R value samples using the two spherical form factor models resulted in notable problems with predicted versus known volume fractions, and/or discrepancies between the measured and calculated I(Q) distributions over unacceptably wide regions of Q. By visual inspection the low Q region can be best evaluated on the linear plot (ellipsoid favored over polydisperse spheres), and the high Q portion is magnified on the log-log depiction (polydisperse spheres appears to give a better description than ellipsoids). The statistical fit quality (sum of weighted squared residuals [1]) was best in the case of ellipsoids, since it provides a notably better account of the data at low Q where the weightings are greatest (see left panel linear plot). In spite of these subtleties, it is important to reiterate that neither of the spherical models could fit the entire set of data from R = 0 to R = 1, whereas the ellipsoid model was successful. As shown in the main manuscript (Table 1), this ellipsoid model indicated that the nanodomains appear to become progressively more elongated as the ionic liquid is added.

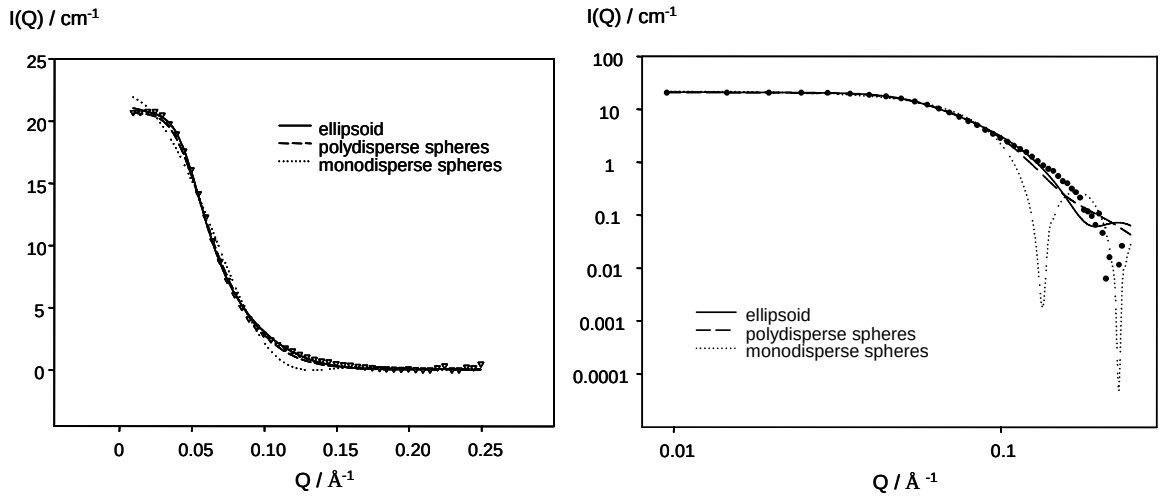

Figure S2 SANS data and model fits for the R = 0.5 system, described in the manuscript, in linear and log-log representations. Fitted parameters: ellipsoid (see Table 1 in manuscript); polydisperse spheres average radius r_{av} 24.7 Å, polydispersity width σ / r_{av} = 0.25; monodisperse spheres radius r = 33.8 Å.

Therefore, the final fitting analysis employed an ellipsoid form factor for the IL+T-X100 droplets, with fitting parameters incoherent background *B* (which was essentially 0 after the subtraction procedure outlined above), semi-minor axis *r* and semi-major axis *l*, defining the aspect ratio as *l*/*r*. The scale factor is proportional to the difference in scattering length densities $(\rho_{(IL+T-X100)} - \rho_{(C6D12+T-x100)})^2$ and the particle volume fraction.

References

1. R.K. *FISH Data Analysis Program;* Rutherford Appleton Laboratory; Report RAL-89-129; CCLRC: Didcot, U.K., 1989.
2. Kotlarchyk, M.; Chen, S.-H.; Huang, J. S.; Kim, M. W. *Phys. Rev. A*. **1984**, *29*, 2054
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