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Heterogeneous decoration of ionic mesopores by ionic and poly(ionic) liquids seen by SAXS and SANS

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The molecular structure of mesoporous solid ionic systems is crucial for optimizing macroscopic properties, in particular ionic transport for energy applications. It will be shown how the combination of SAXS and SANS can be used to extract quantitative structural information on the nanoscale by appropriate rescaling in both contrast and scale. We report on the structural analysis of ionic liquid and poly(ionic liquid) embedded in ionosilica matrices, employing a combination of small-angle scattering of neutrons and X-rays, isotopic substitution, and physico-chemical solvent-based extraction methods. Data analysis is based on molecular modelling with an original, quantitative comparison of the scattering curves under different contrasts. In agreement with NMR, it is shown that these mesoporous systems have an unexpected molecular structure, with the ionic liquid counterions penetrating the ionosilica matrix surrounding the mesopores. The poly(ionic liquid) forms patches decorating the pore walls (see Figure 1), with tunable conformation sensitive to solvent conditions.

Abstract Title

Primary author: OBERDISSE, Julian (Université Montpellier)

Presenter: OBERDISSE, Julian (Université Montpellier)

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