Laboratoire Physicochimie des Electrolytes, Colloïdes, et Sciences Analytiques
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SEMINAIRE

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Behaviour of ionenes, model hydrophobic polyelectrolytes, in aqueous solution

Hydrophobic polyelectrolytes (PEs), containing both charged and hydrophobic residues, can be taken as simplified models of organic substances. They have been the subject of many theoretical and experimental studies, trying to understand both their conformation and dynamics in bulk water and ultimately under confinement, with both environmental or biological applications in mind.We concentrate on model cationic hydrophobic PEs, ionenes, which possess three crucial advantages over the widely used partially sulphonated polystyrene sulphonates (PSS): the presence of charge on the PE backbone, absence of bulky side groups and regular, easily tunable charge density [1]. Ionenes have been very little studied by scattering techniques so-far. We present small angle neutron scattering results on aqueous solutions of ionenes at different monomer concentrations, charge density and nature of couterions (halide anions). We come to three major conclusions so far: 1) a clear polyelectrolyte peak is observed up to a monomer concentration of 0.5 -1.0 molar for all ionene charge densities used; 2) for a given concentration, the position of the polyelectrolyte peak is insensitive to the charge density, which contrasts with previous data obtained for PSS [2] and 3) a clear counterion effect is observed between the fluoride and bromide counterion: the polyelectrolyte peak in case of fluoride survives to much higher monomer concentrations (3 molar). This last observation seems consistent with the greater affinity of bromide ion for the ionene backbone, as seen by measurements of conductivity [3] and atomic scale simulations [4]. Experimental evidence exists for the so-called pearl-necklace configuration of partially sulphonated PSS in water [2]. It remains to be seen whether it also applies for ionenes.

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[3] M. Luksic, B. Hribar-Lee, V. Vlachy, J. Phys. Chem. B 2010, 114, pp. 10401-10408.
[4] M. Druchok, V. Vlachy, K. A. Dill, J. Phys. Chem. B 2009, 113, pp. 14270-14276.

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