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Investigating Polyzwitterion and Polyanion Mixture Using Neutron Scattering: An Effective Polyelectrolyte Solution

Polyzwitterions (PZ) and polyanions (PA) mixtures attract a surge of interest due to their broad applications. Here, employing molecular dynamical simulations and neutron scattering experiments, we investigate the structures and dynamics of poly(3-(2-vinyl-1-pyridiniumyl)-1-propane sulfonate) (P2VPPS) and sodium poly(styrene sulfonate) (NaPSS) solutions in dilute regimes. Both simulation and experiment results reveal the emergence of a peak in the PZ structure factor under various polymer concentrations and molecular weights. We interpret this feature as the outcome of PZ-PA complexations, leading to an interesting concept—effective polyelectrolyte solutions. The idea suggests that PAs dominate such systems. While this idea qualitatively accounts for the observed de Gennes narrowing in the PZ dynamical structure factor, the dynamics remain qualitatively distinct from those of pure PA solutions, necessitating the theoretical development of dynamics. This work provides insights into PZ-PA systems and motivates more comprehensive future studies.

Topical Area

Soft matter: polymers, and complex fluids

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