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Orientational Anisotropy and Effective Electrostatic Interactions in Polyelectrolyte Star Solutions[1] HAO WANG, ALAN R. DENTON, Department of Physics, North Dakota State University — In solutions of polyelectrolyte (PE) star macroions, electrostatic interactions between charged arms of approaching macroions can induce anisotropy in the arm orientational distributions. Within a rigid arm model, we explore the influence of arm orientational anisotropy on the effective pair interactions between stars. For strongly charged arms, where electrostatic energies much exceed thermal energies, a torque balance calculation predicts significant arm anisotropy and a corresponding change in the effective pair interaction between stars. For weakly charged arms where electrostatic and thermal energies are comparable, two independent methods – one based on classical density-functional theory and the other on the Smoluchowski equation – yield identical expressions for the equilibrium arm orientational distribution and numerical results suggest relatively weak orientational anisotropy. The resulting effective pair interactions between charged stars are fit with simple analytical functions.

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