Abstract Submitted
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Demixing of Charged Colloid-Polymer Mixtures: Variational Theory[1] SHRIKANT SHENOY, ALAN R. DENTON, Dept. of Physics, North Dakota State University — We investigate thermodynamic phase behavior of mixtures of charged colloids and neutral nonadsorbing polymers using a variational method for the free energy. The mixture of macroions, microions, and solvent is first mapped onto an effective one-component system of pseudomacroions that interact via effective electrostatic interactions. The polymers are modeled as effective spheres that have hard interactions with the colloids but are mutually ideal. The charged colloid-polymer mixture is then mapped onto an Asakura-Oosawa model with effective colloid and polymer diameters[2]. The free energy is approximated by combining thermodynamic perturbation theory for the colloids with free-volume theory for the polymers and minimizing with respect to the effective colloid diameter. Phase diagrams are computed by a coexistence analysis that ensures equality of pressures and of chemical potentials of all species in the two phases. The resultant phase behavior depends sensitively on colloid charge, polymer-to-colloid size ratio, and composition. Electrostatic repulsion between colloids is found to stabilize the mixture against polymer depletion-induced demixing, consistent with previous predictions[3] and experimental observations.

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[2] A. R. Denton and M. Schmidt, *J. Chem. Phys.* **122**, 2449111 (2005).

Shrikant Shenoy
Department of Physics, North Dakota State University

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