Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dramatic Changes in Polyelectrolyte Blend Phase Behavior due to Charge Correlations MONICA OLVERA DE LA CRUZ, JOS ZWANIKKEN, CHARLES SING, Northwestern Univ — Polymer blends are typically used to impart a unique combination of properties to a material using a blend of two or more common homopolymers. Designing such systems requires knowledge of the mixing thermodynamics of the two polymers being blended; if one species is charged (e.g. an ionomer), then the thermodynamics is highly dependent on both the tendency of the system to mix (via the ubiquitous Flory χ-parameter) and the electrostatics of the charged polymer backbone and the corresponding counterions. While mean-field theories treat the former well, the latter is difficult in low dielectric constants due to the inadequacy of perturbation theories in describing highly-correlated charged structures. We demonstrate that a new hybrid liquid state integral equation-self consistent field theory (LS-SCFT) calculation can provide articulation of both local charge correlations as well as macroscopic thermodynamics, and show that these correlations can profoundly affect polyelectrolyte blend phase behavior. Ultimately, even polymers that mix at all temperatures ($\chi N = 0$) can be driven to phase separate upon inclusion of charges.

Charles Sing
Northwestern Univ

Date submitted: 14 Nov 2013

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