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Effect of Charge Patterning on the Phase Behavior of Polymer Coacervates for Charge Driven Self Assembly MITHUN RADHAKRISHNA, CHARLES E. SING, University of Illinois at Urbana-Champaign — Oppositely charged polymers can undergo associative liquid-liquid phase separation when mixed under suitable conditions of ionic strength, temperature and pH to form what are known as 'polymeric complex coacervates'. Polymer coacervates find use in diverse array of applications like microencapsulation, drug delivery, membrane filtration and underwater adhesives. The similarity between complex coacervate environments and those in biological systems has also found relevance in areas of bio-mimicry. Our previous works have demonstrated how local charge correlations and molecular connectivity can drastically affect the phase behavior of coacervates. The precise location of charges along the chain therefore dramatically influences the local charge correlations, which consequently influences the phase behavior of coacervates. We investigate the effect of charge patterning along the polymer chain on the phase behavior of coacervates in the framework of the Restricted Primitive Model using Gibbs Ensemble Monte Carlo simulations. Our results show that charge patterning dramatically changes the phase behavior of polymer coacervates, which contrasts with the predictions of the classical Voorn-Overbeek theory. This provides the basis for designing new materials through charge driven self assembly by controlling the positioning of the charged monomers along the chain.

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