

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Effects of charge connectivity on macromolecular complexation

JIAN QIN, Stanford University — Mixing solutions of polycations and polyanions under favorable conditions results in the formation of a liquid-like polymer-rich complex phase known as coacervate. The coacervate typically coexists with a supernatant that is nearly depleted of polymers. The coexistence is conventionally rationalized by using the Voorn-Overbeek model, which treats the electrostatic correlation free energy at the Debye-Hückel level. A key physics missing from this model is charge connectivity. We model the charge connectivity by using the structure factor, couple it to the Gaussian theory for electrostatic correlation free energy, and show that the charge complexation is greatly enhanced. The degree of enhancement is quantified by the scaling exponent for the molecular weight dependence of the minimum charge density needed to induce complexation, which is shown to correlate strongly with the fractal dimension of macromolecules.

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Date submitted: 10 Nov 2016

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