



Phase transitions in mixtures of micelles and polyelectrolytes: electrostatic assembly of soft colloids

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Mixtures of polyelectrolytes and oppositely-charged particles or micelles commonly separate into two coexisting liquid phases (“coacervation”). Despite the practical importance of these systems in tertiary oil recovery and in industrial materials, there remain many mysteries about the mechanisms of coacervation.

- Light scattering and microscopy reveal self-assembled colloidal aggregates that appear spontaneously and grow as the sample is heated. They reach a radius of up to 180 nm in single-phase samples (left photo).
- After coacervation, aggregates of the same size are found in the supernatant, in coexistence with the coacervate. Their presence indicates that the transition may be driven by interactions among these aggregates.
- Electron microscopy and neutron scattering show mesoscopic features inside the concentrated coacervate phase. We hypothesize that the coacervate phase may be a concentrated liquid of the aggregates rather than a homogeneous phase.

We seek insight into the general mechanisms of coacervation and aim to offer a predictive model to describe a range of materials.

An aggregate of **polycations** and **anionic micelles**.

A fluid of aggregates?

