Relaxation Times in Polyelectrolyte Complexes and The "Sticky" Association Theory



Introduction

Oppositely charged polyelectrolytes in solution spontaneously associate into hydrated complexes or coacervates, PECs. The morphology, stability and properties of PECs depend strongly on their ion content, which moderates the "sticky" reversible interactions between Pol⁺ and Pol⁻ oppositely charged repeat unites. Here, the linear viscoelastic responses of a series of PECs made from pairs of poly[3-(methacryloylamino)propyltrimethylammonium chloride] and poly(sodium methacrylate) with various molecular weight were measured. Timetemperature superposition revealed entangled behavior and characteristic relaxation times. Increasing [Salt]



Linear Viscoelasticity of PECs

The linear viscoelasticity of PECs has been broadly studied. However, the entanglement behavior and relaxation times of PECs (e.g. τ_{b} , τ_{e} and τ_{rep}) still need to be further investigated. A complete linear viscoelasticity response of PEC is required.



Reference (1) Spruijt et al., *Macromolecules*, 46, 4, 1633-1641 (2013); (2) Marciel et al., Soft Matter, 14, 2454-2464 (2018); (3) Hamad et al., Macromolecules, 51, 15, 5547-5555 (2018)

How to obtain τ_b , τ_e and τ_{rep} for PECs? A PEC system with higher Mw polyelectrolytes and narrower molecular weight distribution.





Higher molecular weight polyelectrolytes will be easier to get entangled.

Narrow Mw distribution will help to reduce the plasticizing effect. Also, it benefits theory fitting.

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1. Rubinstein and Semenov, Macromolecules, 31, 1386-1397 (1998)





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