Abstract Submitted
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Protein-Polyelectrolyte Coacervation: Morphology Diagram, Binding Affinity, and Protein Separation[1] DAVID HOAGLAND, Polymer Sci. and Eng. Dept., Univ. of Mass. Amherst, XIAOSONG DU, Polymer Sci. and Eng. Dept., Univ. of Massachusetts Amherst, PAUL DUBIN, Chemistry Dept., Univ. of Massachusetts Amherst — For aqueous mixtures of negatively charged polysaccharide, hyaluronic acid (HA), and globular protein, either bovine serum albumin (BSA) or beta-lactoglobulin (BLG), a pH-ionic strength (I) morphology diagram, with regions of homogeneous solution, soluble complex, coacervation, precipitation, and redissolution, was developed by pH titrations performed at fixed I. The systems are models for coacervation, or liquid-liquid phase separation, between flexible and compact solutes of opposite charge. Protein charge here is tuned by pH, and titration keeps the mixtures close to equilibrium. At high I, only homogeneous solution is observed, as true at high and low pH. Diagrams for the proteins differ because HA affinity for BSA is higher than for BLG, traced to BSA's greater charge patchiness and higher net charge; isothermal solution titration calorimetry finds a factor of two difference in binding energy. Dependences of transition pH on protein charge Z and solution I offer additional insights into interactions underlying morphology transitions. At optimal conditions, the affinity disparity is sufficient to achieve highly selective BSA coacervation in a 1:1 protein mixture, suggesting coacervation to separate similar proteins under mild, non-denaturing conditions.

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