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Effect of Protein Surface Potential on Globular Protein-Polymer Block Copolymer Self-Assembly[1] CHRISTOPHER LAM, MINKYU KIM, CARLA THOMAS, DONGSOOK CHANG, Massachusetts Inst of Tech-MIT, GABRIEL SANOJA, University of California Berkeley, CHIMDIMMA OKWARA, BRADLEY OLSEN, Massachusetts Inst of Tech-MIT — The effects of protein surface potential on the self-assembly of protein-polymer block copolymers are investigated in globular proteins with a controlled shape through two approaches: (1) the self-assembly of the two structurally homologous proteins mCherry and EGFP conjugated to poly(N-isoprpopylacrylamide) (PNIPAM) and (2) bioconjugates containing mutants of mCherryS131C are prepared to specifically alter the electrostatic patchiness of the protein. Despite the large difference in amino acid sequence between mCherry and EGFP, identical phases are observed in concentrated solution at low temperatures and in bulk. At high temperatures above the thermoresponsive transition temperature, differences in micellar stability are observed at low concentrations, and different phases are observed between conjugates at high concentrations. Similarly, conjugates of four mCherryS131C variants with changes to their electrostatic surface patchiness showed minimal change in the concentrated solution phase behavior. Measurements of protein/polymer miscibility, protein second virial coefficients, and zeta potential indicate that coarse-grained interactions are able to largely capture the relevant physics for soluble, monomeric globular protein-polymer conjugate self-assembly.

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