9-4-2014

Controlling Micelle Formation Using Mixtures of Linear and Foldon-capped Polypeptides (ELP): Measurements with UV-vis Spectroscopy

John P. Gavin
Cleveland State University

Michael G. Price
Cleveland State University

Janna Mino
Cleveland State University

Nolan Holland
Cleveland State University, N.HOLLAND1@csuohio.edu

Kiril Streletzky
Cleveland State University, K.STRELETZKY@csuohio.edu

Controlling micelle formation using mixtures of linear and foldon-capped polypeptides (ELP): Measurements with UV-vis spectroscopy

Washkewicz College of Engineering and College of Sciences and Health Professions

Student Researchers: John P. Gavin, Michael G. Price, and Janna Mino

Faculty Advisors: Nolan B. Holland and Kiril A. Streletzky

Abstract

Polymer surfactants developed in our lab have a protein headgroup (foldon) and three elastin-like polypeptide (ELP) tails. They can form micelles smaller than 30 nm, which may be useful in developing targeted drug delivery vehicles. Specifically, ELPs are capped with foldon, which is a 27 amino acid sequence that folds as a homo-trimer, resulting in a three-armed star polypeptide. This structure has been shown to form micelles above the transition temperature (T_t) of the ELP. The salt concentration affects the interaction between the headgroups affecting how the micelles assemble. At low salt concentrations the ELP-foldon will form spherical micelles; whereas, at higher salt concentrations the micelles are non-spherical, as is demonstrated by light scattering. When linear ELP is mixed with ELP foldon, it is expected that the ELP-foldon will stabilize small droplets of linear ELP in the form of a microemulsion. Different ratios of ELP-foldon to linear ELP were prepared and their transition behavior was characterized using turbidity measured with UV-vis spectroscopy. The turbidity increased at the T_t of the ELP, and then dropped substantially at the T_t of the ELP-foldon. Increased concentration of the linear ELP increased the measured turbidity level after both transitions, suggesting an increase in aggregate size. Light scattering was utilized to further characterize the size and shape of the aggregates formed.