2016

Light Scattering Characterization of Elastin-Like Polypeptide Trimer Micelles

Ilona Tsuper
Cleveland State University

Daniel Terrano
Cleveland State University

Adam Maraschky
Cleveland State University

Light Scattering Characterization of Elastin-Like Polypeptide Trimer Micelles

College of Sciences and Health Professions and Washkewicz College of Engineering

Student Researchers: Ilona Tsuper, Daniel Terrano, and Adam Maraschky

Faculty Advisors: Nolan Holland and Kiril A Streletzky

Abstract

Elastin-Like Polypeptides (ELP) can be used to form thermo-reversible vehicles for drug delivery systems. The ELP nanoparticles are composed of three-armed star polypeptides. Each of the three arms extending from the negatively charged foldon domain includes 20 repeats of the (GVGVP) amino acid sequence. The ELP polymer chains are soluble at room temperature and become insoluble at the transition temperature (close to 50 oC), forming micelles. The size and shape of the micelle is dependent on the temperature and the pH of solution, along with the concentration of the Phosphate Buffered Saline (PBS) solvent. The technique of Depolarized Dynamic Light Scattering (DDLS) was employed to study the structure and dynamics of micelles at 62 oC; the solution was maintained at an approximate pH level of 7.3 - 7.5, while varying the concentration of the solvent (PBS). At low salt concentrations (< 15 mM), the micellar size is not very reproducible due to unstable pH levels, arising from low buffer concentration. At intermediate salt concentrations (15 – 60 mM), the system formed spherically-shaped micelles exhibiting a steady growth in the hydrodynamic radius (Rh) from 10 to 21 nm, with increasing PBS concentration. Interestingly, higher salt concentrations (> 60 mM) displayed an apparent elongation of the micelles evident by a significant VH signal, along with a surge in the apparent Rh. A model of micelle growth (and potentially elongation) with increase in salt concentration is considered.