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P2: Light Scattering Study of the Size and Shape of Mixed Elastin-Like Polypeptide Micelles

Ilona Tsuper
Cleveland State University

Daniel Terrano
Cleveland State University

Bryce Noe
Cleveland State University

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College of Sciences and Health Professions and
Washkewicz College of Engineering

Student Researchers: Ilona Tsuper, Daniel Terrano, Bryce Noe, and Richard Schmitt

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

Abstract

Elastin-Like Polypeptides (ELP) can be used to form thermoreversible 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 include 20 repeats of the (GVGVP) amino acid sequence. In addition, linear constructs composed of 40 repeats of the same (GVGVP) sequence are introduced into the system. The mixed ELP polymer system is soluble at room temperature and becomes insoluble at the transition temperature (~ 50°C) forming micelles with the foldons on the exterior and linear constructs at the core. Above the transition, the size and shape of the mixed micelles are dependent on the pH of the solution, concentration of the PBS solvent, and the ratio of the linear to foldon concentration. The technique of Depolarized Dynamic Light Scattering (DDLS) was employed to study the structure and dynamics of the mixed micelles at 62°C and maintained at an approximate pH level of 7.3 - 7.5. The ELP foldon micelles have a radius of 10 nm; the introduction of the linear concentration leads to a growth of mixed micelles at a linear rate, when the PBS and foldon concentrations are fixed. A model explaining this linear growth was developed utilizing the molar volumes of the mixed system. Static Light Scattering results seemingly support this model. However, the apparent VH signal found can indicate elongation in the geometry of the particles or anisotropic properties of the core of the mixed micelle.