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Light Scattering Study of Mixed Micelles Made from Elastin-Like Polypeptide Linear Chains and Trimers

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Abstract

Temperature sensitive nanoparticles (E20F) were generated from a construct of three chains of Elastin- Like Polypeptides (ELP) linked to a negatively charged foldon domain. This ELP system was mixed at different ratios with a single linear chain of ELP (H40L) which was deprived of the foldon domain. The mixed system is soluble at room temperature and at a transition temperature will form swollen micelles with the hydrophobic linear chains hidden inside. This system was studied using Depolarized Dynamic Light Scattering (DDLS) and Static Light Scattering (SLS) to model the size, shape, and internal structure of the mixed micelles. The mixed micelle in equal parts of E20F and H40L show a constant apparent hydrodynamic radius of 40-45 nm at the concentration window from 25:25 to 60:60 μM (1:1 ratio). At a fixed 50 μM concentration of the E20F with varying H40L concentrations from 5 to 80 μM, a linear growth in the hydrodynamic radius is seen from about 11 to about 62 nm, along with a 1000-fold increase in VH signal. A possible simple model explaining the growth of the mixed micelles is considered. Lastly, the VH signal can indicate elongation in the geometry of the particle or could possibly be a result from anisotropic properties from the core of the micelle. Static Light Scattering was used to study the molecular weight, and the radius of gyration of the micelle to help identify the structure and morphology of mixed micelles and the tangible cause of the VH signal.