414a Exploring Sequence Space of a New Biological Nanowire: Kinetics of Γ Prefoldin Filament Formation

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Oligomeric proteins hold tremendous promise in creating a range of useful self-assembling structures on the nano- to microscale. Examples in Nature include actin, tubulin, phage virus coat proteins, and the small heat shock protein. Besides allowing for self-assembly in aqueous environments, an additional advantage of proteins is that they can be easily functionalized through standard genetic engineering techniques, enabling incorporation of new chemistries or allowing gene fusions with existing enzymes.

We have recently discovered a new type of filamentous protein from an Archaeal microorganism. When assembled *in vitro*, it forms filaments of polydisperse length, 200 nm – 2 μM, and monodisperse width 8-9 nm and height 3-4 nm, as measured by TEM and AFM. The full-length filament shows a persistence length on the order of 200 nm at room temperature and is stable in a temperature range from 4 to at least 95 ^{o}C. We describe here the kinetics of filament formation, along with several genetic variants. We also present initial data on potential applications, including ordered enzyme arrays and inorganic templates.