Force Spectroscopy on Spider Silk Particles

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In the past years, the investigations on natural and artificial spider silk have caught a lot of attention, not only in the scientific world. Spider silk is gifted with amazing properties making it a promising material for various applications; it combines both elasticity and mechanical strength and at the same time it is biocompatible. Scheibel et al. [1] succeeded in synthesizing an artificial spider silk that mimics its natural prototype and can be processed into different morphologies, such as fibers or gels, but also micro-capsules and particles. The latter may once be employed as novel drug carrier vehicles; first studies have proved this potential [2].

Our aim is to characterize these particles by a micro-mechanical approach. Therefore, we perform force spectroscopy experiments using the atomic force microscope (AFM) as main device. The colloidal probe technique provides a defined contact geometry and allows for precise measurements yielding data about elasticity, mechanical stability and adhesion. Beyond these parameters, we also want to explore the influence of drug loading and the interplay between applied forces and the release of fluorescently labeled model drugs. Here, the AFM is combined with an inverted optical microscope; similar experiments have recently been performed on polyelectrolyte multilayer capsules [3].