

Title: Development of actuated biopolymers for mechanobiology

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Duration: Master Thesis / Semester Project

Description of the Project

Recent work has conclusively shown that, along with chemical signals, mechanical properties of the microenvironment and externally applied forces play an important role in biological organization and function. MICROBS Laboratory has been developing small scale soft actuated biomaterials that can transduce electromagnetic energy into mechanical work. As an example, we utilize the longitudinal surface plasmon resonance of gold nanoparticles (AuNPs) to reversible control the temperature of thermoresponsive polymers, and consequently their swelling state. This methodology provides spatiotemporally controlled transduction of energy with high efficiency and wavelength selectivity.

The goal of this project is to optimize the protocol for the synthesis of gold nanoparticles, generate a library of particles that respond to different wavelengths, and decorate the particles with orthogonal properties such as magnetization. The student is also expected to explore functionalization of these particles along with the biopolymer coating for better integration of the actuators into biological systems.