Stimuli-Responsive Nanoparticles for Health, Energy, and Biosensing

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**Abstract:** This presentation will describe small photonic nanoparticles having diameters less than 100 nm and systematically tunable extinctions ranging from visible to near infrared (NIR) wavelengths. These nanoparticles serve as versatile nanoscale tools, where the particles can be optically detected/modulated by irradiation with NIR light. Highlighted here will be the preparation, characterization, and applications of these hollow "nanoshell" particles, which possess a variety of dimensions, chemical compositions, and optical properties. In particular, current synthetic strategies allow the preparation of NIR-active nanoshells that possess diameters as small as 40 nm, which opens the door to new medical diagnostics and therapies, as well as unique opportunities in the energy sector, where such nanoshells offer unique benefits in plasmon-enhanced solar-to-fuel conversion. Separate studies targeting the development of cubic and spherical magnetic nanoparticles for biosensing will also be described, with the unexpected finding that cubic magnetic nanoparticles offer a variety of advantages when compared to the more widely utilized spherical magnetic nanoparticles.