# Self-assembly and Characterization of Macroscopic Monolayer Films Composed of Ligand Gold Coated Nanospheres

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This project’s objective was to build materials with unique optical properties, such as a custom tailored refractive index, with applications in solar cells and fiber-optics. Using self-assembly, films composed of gold nanospheres were tested to determine the effect of tuning the refractive index by varying alkane chain lengths, to determine the wavelengths at which the max absorbance peaks occurred. To create films, glass slides were placed in a solution consisting of, gold nanospheres, alkane-thiol chains, tetrahydrofuran (THF), and water, where self-assembly occurred. Testing was conducted using Visible and NIR spectrometers. Data obtained demonstrated that as the alkane chain decreased from C18-C1 the wavelengths of the max absorbance peaks red-shifted then blue-shifted. When observing peaks in the visible spectrum, we understand that the electrons are vibrating at high speeds within a single particle. A blue shift after C3 suggested quantum tunneling (electrons tunneling from one particle into another). The self-assembly of gold nanoparticles was an ideal solution to the challenge of creating these films. The gold nanoparticles could be quickly phase transferred with thiol-ligands and transported onto glass substrates. Using a spectrometer the trend in wavelength shift and absorbance with respect to different carbon chains was determined and quantum tunneling was measured at the smallest length carbon chains (C1 and C2).