CORE-CM SEMINAR
Michigan State University

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Single-structure Studies of Chiro-optical Nanomaterials

Accurate descriptions of nanoparticle surface plasmon fields are critical for developing a predictive understanding of the many optical processes that they mediate. I will present results obtained from nonlinear optical (NLO) spectroscopy experiments carried out at the single-particle level to probe nanoparticle electromagnetic surface fields. As one example, we report the observation of magnetic dipolar contributions to the NLO response of gold nanoparticle assemblies, using single-particle polarization-resolved second harmonic generation (SHG) spectroscopy. Unambiguous circular dichroism in the SHG signal was observed for many of the structures, indicating the presence of a chiral plasmon field localized within the interparticle gap. Detailed analysis of the polarization line shapes of the SHG intensities obtained by continuous polarization variation suggested that the effect resulted from strong magnetic dipolar contributions to the nanostructure's optical properties. The relative magnetic-dipolar and electric-dipolar contributions to the NLO response were structure dependent, an effect that would have been obscured for ensemble measurements. I will also present femtosecond time-resolved SHG-detected pump –surface plasmon probe results obtained from single nanoparticles, which were used to determine plasmon dephasing rates. These findings may be significant for applications using the plasmonic nanostructure platform including nanoantennas, spintronics, negative index materials, and field-mediated photochemistry, including solar-energy conversion.

Thursday, Nov. 6, 2014
12:00 PM
BPS 1400
Prof. Marcos Dantus - Host