Physics Colloquium

Thursday, May 4th at 3:30 pm in SC 234

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Plasmonics: from noble metals to sustainability

Metallic nanoparticles, used since antiquity to impart intense and vibrant color into materials, have more recently become a central tool in the nanoscale manipulation of light. This interest has led to a virtual explosion of new types of metal-based nanoparticles and nanostructures of various shapes and compositions, and has given rise to new strategies to harvest, control, and manipulate light based on metallic nanostructures and their properties. As one begins to assemble metallic nanoparticles into useful building blocks, a striking parallel between the plasmons- the collective electronic oscillations- of these structures and wave functions of simple quantum systems is universally observed. Clusters of metallic nanoparticles behave like coupled oscillators, introducing effects characteristic of systems as diverse as radio frequency transmitters and coupled pendulums into light-driven nanoscale structures. Plasmons decay by producing hot electrons, a property appearing to be highly useful in applications ranging from photodetection to photocatalysis. While our scientific foundation for the field of Plasmonics has been built on nanoparticles consisting of noble and coinage metals, more recently we have begun to question whether the same, or similar, plasmonic properties can also be realized in more sustainable materials. Aluminum, the most abundant metal on our planet, can support high-quality plasmonic properties across the visible region of the spectrum, enabling practical large-area and cost-effective plasmonic applications such as flat-panel displays and robust colorimetric sensors. Graphene is an outstanding active plasmonic material, however, it can be tuned from the infrared into the visible region of the spectrum only by miniaturization to the true molecular limit.

Refreshments at 3:00 pm in SC 103