Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Ultrafast Excitonic and Plasmonic Processes at the Nanoscale: Understanding Energy Flow in Hybrid Nanostructures GARY WIEDERRECHT, Center for Nanoscale Materials, Argonne National Laboratory — Nanoscale plasmonic and excitonic structures frequently possess ultrafast processes that can be initiated and monitored by light. Nanoscale structures lend themselves to strong light-matter interactions for a variety of reasons, including a tendency towards large optical extinction and polarizability. Many times these nanostructures have strong resonances due to collective excitations with coherence, a property that lends itself very well to optical control opportunities. These types of collective excitations can also couple strongly to excitations of other nanostructures with different composition and with disparate properties in order to realize hybrid excitations. Hybridization presents unique opportunities for inducing directional energy and charge flow initiated by light. Thus, using ultrafast pulses of appropriate photon energy, combined with considerations of material composition and shape, brings the possibility to control energy flow in excitonic and plasmonic hybrid nanostructures. In this talk, I discuss our recent efforts to create and characterize electronically coupled nanostructures and the impact this has on ultrafast photoresponse. These processes have strong impact on applications such as light harvesting and nonlinear optical responses in nanoscale structures. Use of the Center for Nanoscale Materials was supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Contract No. DE-AC02-06CH11357.

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Date submitted: 11 Nov 2014 Electronic form version 1.4