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Ultrafast electronic energy redistribution in hollow gold nanoparticles. KENNETH KNAPPENBERGER[1], Florida State University, ADAM SCHWARTZBERG, LBNL — Nanostructured materials offer great potential for novel ways to generate, utilize, store and transport energy. These unique opportunities arise because nanoclusters often portray strikingly different chemical and physical properties than their bulk counterparts, and, perhaps more intriguingly, these vary widely with cluster size and shape. Here we report on the redistribution of electronic energy to thermal phonons in a series of hollow gold nanoparticles using femtosecond transient absorption. Qualitatively, the relaxation processes are similar to those of solid nanoparticles, however distinct differences are observed, likely owing to the unique properties of the hollow structures. In particular, a larger excitation power density is required to observe coherent vibrational oscillations in hollow gold nanoparticles than is needed for solid particles following electronic excitation. This effect is systematically studied over a range of hollow and solid particles, including multiple diameters and wall thicknesses. Models will be presented to account for the different relaxation mechanism observed for hollow and solid gold nanoparticles.

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