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Photothermal properties of gold nanocages studied by time-resolved spectroscopy MIN HU, JINGYI CHEN, YOUNAN XIA, XINGDE LI, University of Washington, Seattle, HRISTINA PETROVA, GREGORY HARTLAND, University of Notre Dame, MANUEL MARQUEZ, INEST Group, Research Center, Philip Morris USA Inc. — Gold nanocages of different sizes synthesized via galvanic replacement reaction have been studied by ultrafast time-resolved spectroscopy. The vibrational phonon modes were excited and the periods of these modes increase with the size of the gold nanocages. For a specific size of nanocage, experiments with different excitation powers of the pump laser were performed (from 2 μJ to 20 μJ), we found that the period of the vibrational mode increased with the laser intensity. This was compared to experiments on spherical gold nanoparticles, which allow us to roughly estimate the temperature of the nanocages when the electrons and the phonons reach the equilibrium. The temperature of the nanocages can increase up to 1000 K, near the melting point of the bulk metal, while the particles maintain their integrity. This makes the nanocages potentially useful for photothermal therapy applications. The heat dissipation rate for the nanocages was also studied in these experiments, and was found to have the similar trend as spherical nanoparticles, i.e., larger particles stay hot for longer times than smaller particles.

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