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Coherent acoustic vibrations of metal nanoshells A.S. KIRAKOSYAN, T.V. SHAHBAZYAN, Jackson State University, C. GUILLON, P. LANGOT, N. DEL FATTI, F. VALLEE, Centre de Physique Moleculaire Optique et Hertzienne CNRS and Universite Bordeaux I, France, T. CARDINAL, M. TREGUER, Institut de Chimie de la Matiere Condensee de Bordeaux CNRS and Universite Bordeaux I, France — We study vibrational modes of gold nanoshells grown on dielectric core by means of time-resolved pump-probe spectroscopy. The fundamental breathing mode launched by a femtosecond pump pulse manifests itself in a pronounced time-domain modulation of the differential transmission probed at the frequency of the nanoshell surface plasmon resonance. The modulation amplitude is significantly stronger while the period is longer than in a gold nanoparticle of the same overall size. A theoretical model describing breathing mode frequency and damping for a nanoshell in a medium is developed. A distinct acoustical signature of nanoshells provides a new and efficient method for identifying these versatile nanostructures and for studying their mechanical and structural properties.

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