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Acoustic vibrations of complex metal nanostructures[1] AFTAB AHMED, Argonne National Laboratory, ANNA KLINKOVA, EUGENIA KUMACHEVA, University of Toronto, Canada, JEFFREY GUEST, Argonne National Laboratory — Coherent acoustic vibrations of plasmonic nanoparticles modulate light at ultrahigh frequencies. Plasmonic nanoparticles are of particular interest because of their high absorption cross sections, and offer wide range of applications including sensing and nano-mechanical devices. Here we show acoustic vibrations of complex metal nanostructure using a femtosecond pump-probe technique. The studied nanostructure is composed of an octahedral core (Au) and cube shell (Ag). Unique elastic properties and complex geometries of the two metals provide a richer transient absorption spectrum as compared to that of a simple nanocube of similar dimensions. Further, two different vibrational modes are detected at different probe wavelengths. Numerical simulations were carried out to explain our experimental findings and to study the dynamics of the complex structure. Dependence of the excited modes on the pump wavelength is also investigated. These oscillations provide insights into the mechanical properties of the material at nanoscale.

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