

GENERATION OF SOUND BY METAL
NANOCLUSTERS IN A DIELECTRIC MATRIX

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S u m m a r y

We develop the theory of the photo-acoustical effect caused by a laser action on metal nanoclusters embedded in a dielectric matrix. The energy absorbed by clusters propagates through the dielectric matrix and generates sound waves in it by the thermodeformation mechanism. The formulas for an acoustical signal are derived, and the high sensitivity of the sound wave amplitude to the shape of metal clusters, as well to such parameters of a laser irradiation as the frequency, polarization, and intensity, is revealed. The behavior of the amplitude of sound vibrations in a region of the absorption of surface plasmons is studied in detail. It is found that this amplitude at the light absorption by a discrete metal film (a system of clusters in the matrix) can exceed the corresponding amplitude for the absorption by a continuous metal film in the region of plasmon resonances by several orders of magnitude.