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Accession number:WOS:000306513400047
Title:Measuring optical phonon dynamics in a bismuth thin film through a surface plasmon resonance
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Source title:JOURNAL OF APPLIED PHYSICS
Abbreviated source title:J APPL PHYS
Volume:112
Issue:1
Issue date:JUL 1 2012
Pages:013527
Language:English
ISSN:0021-8979
Document type:Article
Publisher:AMER INST PHYSICS, CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA
Abstract:Surface plasmon resonances have become a useful tool for measuring coherent motion in solids, ranging from nanoparticle dynamics to acoustic vibrations in thin films. The non-linear electronic response near the surface plasmon resonance can significantly enhance transient optical measurements, making efficient detection of the coherent motion possible. In this work, we measure coherent optical phonon dynamics in a thin bismuth film through a surface plasmon resonance. We observe distinct changes in the measured amplitude and phase of the fully symmetric A1g optical phonon mode that are not explained through the standard model of displacive excitation of coherent phonons. In particular, near the surface plasmon resonance, we observe a strong polarization dependence on the amplitude and phase of the optical phonon. These results are explained through the rapid change of the optical reflectivity as a function of the complex dielectric constant near the surface plasmon resonance. (C) 2012 American Institute of Physics. [http://dx.doi.org/10.1063/1.4731738]
Number of references:33
Main heading:Physics
DOI:10.1063/1.4731738