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标题: Terahertz Spectroscopy of Ni-Ti Alloy Thin Films
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摘要: We investigate the charge transport in nickel-titanium (Ni-Ti) alloy thin films using terahertz (THz) transmission spectroscopy. Ni-Ti alloys have peculiar mechanical properties such as shape memory effects. Electrical conductivity can be a good measure to characterize the alloy phase transitions, yet the carrier transport properties of this material are relatively unexplored in the thin film regime. We grew 60-80-nm Ni-Ti alloy films of various Ti concentrations (0-100%) on intrinsic Si substrates by Ar plasma sputtering. We carried out THz transmission spectroscopy of the samples using broadband THz pulses. The broadband THz pulses were generated by optical rectification of femtosecond laser pulses in a 1-mm ZnTe crystal. The light source was a 1-kHz Ti: sapphire amplifier producing 800-nm femtosecond pulses (pulse energy, 1 mJ; pulse duration, 90 fs). The transmitted THz pulses were measured by either a L-He-cooled Si: Bolometer (sensitive to time-averaged THz power) or by electro-optic (EO) sampling using a 1-mm ZnTe crystal. Analyzing the power transmission data and the transmitted waveforms, we obtained the alloy resistivity as a function of Ti concentration. Sharp changes in the resistivity were observed at the Ti fractions of 22%, 44% and 62%, indicating that structural disorder is greatly enhanced when the alloy undergoes a phase transition.
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