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Phonon Scattering at Nanoparticles in LuAs:InGaAs Nanocomposites FENG HE¹, RODOLFO SALAS², SETH ROBERT BANK³, YAGUO WANG⁴, University of Texas System — Nanocomposites of III-V semiconductors embedded with semi-metallic rare earth nanoparticles grown with molecular beam epitaxy (MBE) have been widely using in optoelectrics and thermoelectrics. Manipulating the growth parameters, e.g, growth rate, particle concentration and surfactant, will allow precise control of electronic and thermal transport properties for specific applications. Fundamental understanding of phonon scattering at nanoparticles in these nanocomposites under various growth conditions is not only scientifically important, but also will facilitate the material growth and device design. We have investigated the ultrafast dynamics of coherent acoustic phonons (CAP) in LuAs:InGaAs nanocomposites with standard two-color femtosecond pump-probe technique. Phonon frequency and life time have been measured in samples grown under different conditions. Our results show that CAP lifetime increases with increasing LuAs deposition, as well as pump fluences. We have also studied the influences of growth rate and surfactant on phonon lifetime.

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