
Time resolved mid-infrared absorption in silica: ultrafast heat transfer observed by direct probing of anharmonic vibrations

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Abstract

The achievement of super-resolution at sub-100 nm scales in wide band-gap materials critically depends on the ability to rapidly quench energy, thereby enhancing energy confinement. In particular, precise control over the rate of thermal transfer and the influence of thermomechanical effects is essential for confining feature sizes well below the optical diffraction limit, making heat and its transport dynamics a central issue in laser-based material processing. In this context, our approach offers a direct investigation into ultrafast heat transport phenomena in laser-irradiated dielectric materials, aiming to reveal the interplay between electronically driven excitation and collisional activation of vibrational modes.

Keywords: femtosecond pulses, laser microstructuring, nonlinear absorption, mid, infrared, Silica.

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