Title	Generation and detection of gigahertz acoustic oscillations in thin membranes
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Abstract	Single crystalline membranes are a perfect model system for the study of coherent acoustic phonon generation and decay in the time domain. Coherent acoustical modes are excited and detected in thin single-crystalline silicon and gallium arsenide membranes with femtosecond pulses in the ultraviolet and infrared wavelength region using the asynchronous optical sampling technique. The measured acoustic spectra are compared with each other and are discussed in terms of different generation and detection mechanisms. A clear dependence of the generated spectra on the absorption length of the pump and probe pulses is observed. It is shown that a short absorption length for the pump pulse leads to the generation of coherent high frequency phonons up to several 100 GHz frequencies. Membranes are demonstrated to be useful as broadband acoustic cavities and can help to disentangle details of high frequency phonon dynamics. Two-layer membrane systems offer additional insight into energy transfer in the GHz frequency range and adhesion properties.
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