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标题: Non-thermal processes of coherent acoustic phonons generation in semiconductors by femtosecond laser

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摘要: Seeking for the new opportunities to efficiently excite GHz-THz coherent acoustic phonons by femtosecond lasers is an active field of research. Several fundamental objectives have to be addressed in order to achieve this acoustic phonons manipulation by femtosecond laser. Among them, the understanding of femtosecond generation of coherent acoustic phonons remains a key route. Several electron-phonon, photon-phonon and phonon-phonon interaction mechanisms are involved in the processes of generation and remain only partially understood up to now. In this paper, we will present a survey of ultrafast photo-generation of coherent acoustic phonon in semiconductors. We will focus first on the generation of the phonons by fs-laser excitation through the photoinduced modifications of nanoscopic internal electric fields (deformation potential) in non-piezo-active [100] GaAs semiconductor. We will show secondly how it is possible to develop more efficient sources by using piezo-active [111], [-1-1-1] and [411] GaAs semiconductors. In that case, generation of GHz acoustic phonon due to inverse piezoelectrical effect is based on ultrafast light-induced screening of the near surface built-in electric field.

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