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First-principles electron dynamics simulation for attosecond science in solids

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Abstract:

Thanks to the rapid progress of the laser technologies, ultrafast electron dynamics in atoms and molecules have been investigated in time-domain with attosecond time resolution. Recently, the attosecond observation technique has been further applied to solid-state materials, and nonequilibrium electron dynamics in solids have been studied. While such attosecond experiments provide a wealth of microscopic information on nonequilibrium dynamics, the experimental results are often complicated and hard to directly interpret. The first-principles calculation based on the time-dependent density functional theory is a powerful tool to describe such complex nonlinear electron dynamics and to provide microscopic insight into the phenomena. In this talk, I will present our recent applications of the first-principles electron dynamics simulations to attosecond experiments for GaAs and Titanium. The joint study of theory and experiment clarified that the laser-induced intraband motion of electrons plays an important role in the transient absorption of GaAs even in the resonantly driving regime. Furthermore, we found that the transient change of the optical-absorption of Titanium originates from the modification of microscopic screening properties due to the light-induced electron localization.

使用言語 : 英語

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