Ultrafast light-induced coherent phonons in condensed matter.

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In this keynote, we discuss the electron/phonon interactions in correlated solids such as piezoelectric semiconductors (GaAs), multiferroic BiFeO3 (BFO), or topological insulators Bi2Te3 (BT). The understanding of the electron/phonon interactions is crucial for transport properties applications of these materials when used in nanodevices where a large simultaneous confinement of electrons and phonons exist. The investigations are carried out in the time-domain thanks to a femtosecond lasers setup following a traditional pump and probe scheme (Fig. 1). The ultrafast laser action provides the opportunity to control the hot electrons population and then offers the possibility to investigate how these electrons interact with other particles. We discuss different mechanisms of coupling such as the deformation potential, the inverse piezoelectricity effect or the thermoelasticity [1]. New insights on the fundamental processes of electron/phonon interactions are then captured in correlated solids such as BFO or BT [2-4].

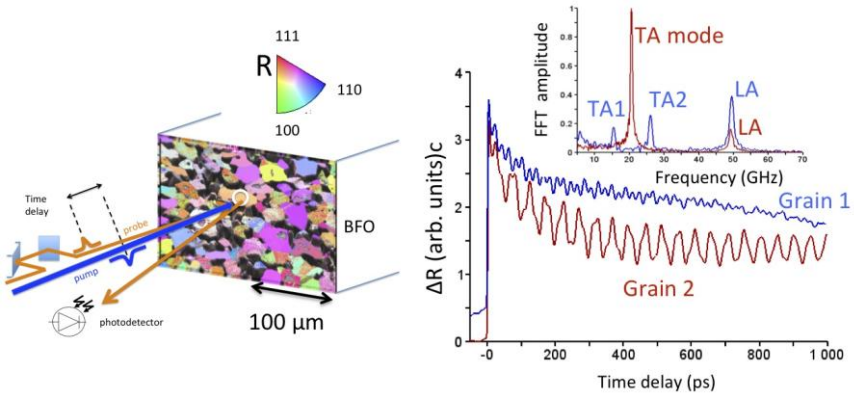

Fig 1 : (left) principle of a pump-probe scheme realiszed on a polycrystalline BFO sample. (right) Time-domain Brillouin detection of LA and TA modes in multiferroci BFO [3].

References :

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