Time-Resolved Terahertz Spectroscopy of Conductive Systems

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In this presentation the author will present a theoretical description of time-resolved THz spectroscopy and its application for research of charge carrier transport in organic-inorganic lead-triiodide perovskites. The knowledge of mechanisms affecting charge carriers transport in semiconductors materials are crucial for many important technologies, including computers, semiconductor lasers, light emitting devices or solar cells. Many crucial processes which shape the optical properties of both bulk and nanostructured semiconductors, such as exciton transitions, dissociation and migration, exciplex formation or free charge carriers migration, exhibit a distinct response in terahertz frequency range. Moreover these processes commonly occur on a femtosecond to nanosecond timescale. The ability to study charge carriers in the terahertz frequency range with sub-picosecond resolution allows detailed characterization of the photovoltaic devices. So far, terahertz time-resolved spectroscopy (TRTS) was used to examine charge carriers movement, scattering, multiplication and trapping in many bulk and nanostructured materials, organic semiconductors and optoelectronic devices.