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Ultrafast dynamics in quantum matter, THz spectroscopy, Femtosecond laser annealing & machining

We are "Ultrafast dynamics Lab" (Figure 1) of the Electrophysics Department, NCTU. Our primary research interests include the following three major parts: (a) Ultrafast dynamics in quantum matter: We have developed all-around pump-probe techniques and tools to investigate different quantum matter. For example, the ultrafast dynamics of monolayer MoS₂ has been studied using the OPA pump and supercontinuum white light probe helicity-resolved spectroscopy, which would play a crucial role in various applications including spintronics, valleytronics, and semiconductor devices (Figure 2). (b) THz spectroscopy: The time-domain measurements of THz radiation generated from topological insulators (TIs) can be performed by ultrafast optical pulse excitation. The present study demonstrates that time-domain THz spectroscopy provides rich information of the optical coupling and the electronic structure of TIs (Figure 3). (c) Femtosecond (fs) laser annealing and machining: Due to the high peak power of femtosecond laser pulses, we have established a laser micromachining and annealing system. The properties of materials could be modified easily in very short period, such as the surface morphology, carrier concentration, carrier mobility, etc. (Figure 4). Key Facilities: Pump-probe spectrometer, Low-temperature cryostat, Fourier transform infrared (FTIR) spectrometer, ultrashort-pulse optical parametric amplifier (OPA), and several other critical equipment necessary in the studies of ultrafast optics.

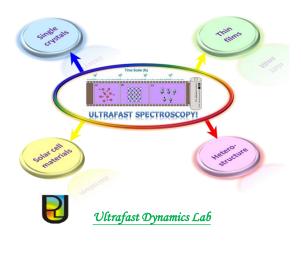
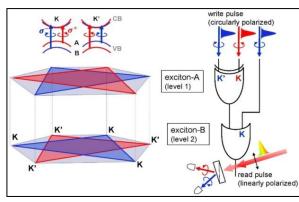
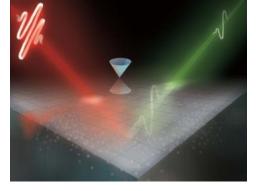


Figure 1





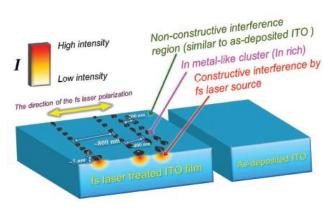




Figure 3

