

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Optical pump-probe studies of carrier dynamics in few-layer MoS₂ RUI WANG, BRIAN RUZICKA, NARDEEP KUMAR, MATTHEW BELLUS, HSIN-YING CHIU, HUI ZHAO, University of Kansas — Molybdenum disulfide is a transition metal dichalcogenide with an indirect band gap of 1.29 eV. Its layered structure allows fabrication of atomically-thin films where the quantum confinement can significantly modify the electronic and optical properties. We demonstrate that a femtosecond pump-probe technique can be used to study charge carrier dynamics in few-layer MoS₂ samples fabricated on Si/SiO₂ substrates by mechanical exfoliation. Carriers are injected by a 780-nm pump pulse via phonon assisted indirect absorption in bilayers or through edge states. Their dynamics are probed by measuring differential reflection of a probe pulse tuned to the excitonic transition near 670 nm. We found that the magnitude, the sign, and the decay time of the signal change dramatically as the probe wavelength is tuned within the excitonic resonance. With a fixed probe wavelength, the differential reflection signal is proportional to the carrier density. The decay time is independent of the carrier density. Besides providing quantitative information on the carrier dynamics in this promising two-dimensional material, our experiment may stimulate further optical studies of carrier dynamics in this material system.

Hui Zhao
University of Kansas

Date submitted: 05 Nov 2011

Electronic form version 1.4