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Ultrafast Dynamics in Bulk and Monolayer MoS_2 Measured with Femtosecond Pump-Probe Technique XIANGHAI MENG, Department of Mechanical Engineering, The University of Texas at Austin, Austin, TX 78712, WENZHI WU, Department of Electrical Engineering, Heilongjiang University, China, AVINASH NAYAK, Department of Electrical and Computer Engineering, The University of Texas at Austin, TX 78712, JUNG-FU LIN, Department of Geological Sciences, The University of Texas at Austin, Austin, TX 78712, DEJI AKINWANDE, Department of Electrical and Computer Engineering, The University of Texas at Austin, TX 78712, YAGUO WANG, Department of Mechanical Engineering, The University of Texas at Austin, Austin, TX 78712 — MoS_2 is a typical material of transition-metal dichalcogenide family. It exhibits unique properties when thickness reduces to monolayer. Recent studies have shown strong photoluminescence (PL) and high carrier mobility on monolayer MoS_2, which makes it a promising candidate for future photonic and field-effect transistor (FET) applications. Our ultrafast measurement utilizes optical 400nm-pump 800nm-probe spectroscopy to reveal the relaxation dynamics of photo-excited carriers in both bulk and monolayer MoS_2. Measurement is carried out at ambient pressure for different pump fluences. Both a fast and a slow carrier lifetime are acquired in monolayer MoS_2 due to different carrier scattering mechanism. Carrier lifetimes are measured at different pump fluences, from which we propose possible carrier relaxation mechanisms. In suspended bulk MoS_2, coherent acoustic phonons with a peak frequency around 38GHz are observed. Phonon lifetime and amplitude at different pump fluences have also been investigated.

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