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Ultrafast Spectroscopy of Exciton and Exciton Dynamics in Few and Monolayer Flakes of WS_2. SUDIKSHA KHADKA, SHROUQ ALEITHAN, MAX LIVSHITS, JEFFERY RACK, MARTIN KORDESCH, ERIC STINAFF, Ohio University — Single layer of Transitional metal dichalcogenides (MX_2) are 2D semiconductor that has a direct band gap in visible spectrum and possesses a strong spin-orbit interaction along with broken inversion symmetry in crystal structure. Thus they have possible application in optoelectronic devices, photovoltaics and photodetection, molecular sensing, 'valleytronics', and flexible transparent electronics. Tungsten Disulphide (WS_2), one of the member of MX_2 family, has a direct band gap of 2.2 eV and a large valley splitting of about 0.4 eV. This leads to the existence of two distinct and direct excitons A and B. Here, we present a detailed study of exciton states and their decay mechanisms in mono and few layer WS_2 using femto-second transient absorption spectroscopy. We report a new peak in its differential absorption spectra at 3.010.1 eV whose origin in k space is under further investigation. The exponential fitting of decay curve of the exciton A reveals three time components as 1.70.3 ps, 33.510 ps and 67015 ps, most likely corresponding to carrier-carrier scattering, carrier-phonon scattering, and radiative relaxation respectively.

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