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Ultrafast spectroscopy of exciton and exciton dynamics in mono and few layers of WS2 SUDIKSHA KHADKA, SHROUQ ALEITHAN, MAX LIVSHITS, JEFFREY J. RACK, MARTIN KORDESCH, ERIC STINAFF, Ohio University — Single layer of Transitional metal dichalcogenides (MX2) are 2D semiconductors that have a direct band gap in visible spectrum and fill the gap in between 2D metallic and insulating materials. They have possible application in optoelectronic devices, photovoltaics and photodetection, molecular sensing, 'valleytronics', and flexible transparent electronics. Tungsten Disulphide (WS2), one of the member of MX2 family, has a direct band gap of 2.2 eV and a large valley splitting of about 0.4 eV. Here, we present a detailed study of exciton states and their decay mechanisms in mono and few layer WS2 using femto-second transient absorption spectroscopy. We report a new peak at 3.010.1 eV whose origin in k space is believed to be at or around K point and further investigation is underway. 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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