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Towards the Intrinsic Limit in As-Exfoliated MoS2 ERIN SUTTON, EDWARD GEORGE, EMILY WHAPHAM, KENNETH BURCH, Boston College, BURCH GROUP TEAM — In recent years, two-dimensional transition metal dichalcogenide (TMDC) semiconductors have been intensively studied as exciting non-zero band gap analogs to graphene. For example, molybdenum disulfide (MoS2), a TMDC, is a van der Waals material which can be thinned down to single atomic layers less than a nanometer thick via micro-mechanical cleavage. In this regime, quantum confinement effects give rise to properties not seen in the bulk crystal. The attractive properties of ultrathin MoS2 have inspired myriad applications, including spin- and valley-tronics, and LED and photo-detecting devices. As the performance of these devices is optimized, a method of modulating these properties is strongly desired. Through exfoliating MoS2 on various substrates in an inert glovebox environment, we have produced as-exfoliated MoS2 doped at the intrinsic level. We study the changes in the MoS2 via Raman and photoluminescence spectra and see shifts in excitonic behavior. The ability to create intrinsic MoS2 without the need for chemical doping or gating has exciting implications for optical studies of the material in addition to device applications such as photovoltaic, photocatalytic, and LED devices.

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