Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Exchange field induced valley splitting in monolayer WSe_2 and WS_2 CHUAN ZHAO, PEIYAO ZHANG, TENZIN NORDEN, State Univ of NY - Buffalo, RENAT SABIRIANOV, University of Nebraska-Omaha, GEORGE KIOSEOGLOU, University of Crete, ATHOS PETROU, HAO ZENG, State Univ of NY - Buffalo — Monolayer TMDCs such as WSe_2 and WS_2 are of great interest for valleytronics applications. The broken inversion symmetry leads to two degenerate but inequivalent valleys K and K'. Together with strong spin-orbit coupling which splits the band edge states, K and K' valleys have opposite spin characters, making it possible to selectively excite carriers within a particular valley using circularly polarized light. Lifting the valley degeneracy allows for control of valley polarization by an electric field. We demonstrated recently that the exchange field from a ferromagnetic EuS substrate can induce strongly enhanced valley splitting in monolayer WSe_2. In this work we show that exchange field effect is dramatically different from that of an external field. We measured the "A" and "B" exciton transition energies of both WSe_2 and WS_2 on EuS substrates using magneto-reflectance spectroscopy. We observed enhanced valley splitting for both samples, yet with opposite signs of the splitting. Moreover, the signs of valley splitting are opposite for "A" and "B" excitons. We attribute these observations to a transition from ferromagnetic to anti-ferromagnetic exchange coupling between EuS and different TMDC materials, since the exchange energy is highly sensitive to interatomic spacing. Using magnetic exchange field therefore provides an attractive avenue for valley control in TMDCs beyond what can be achieved by an external field.

Chuan Zhao
State Univ of NY - Buffalo

Date submitted: 07 Feb 2017 Electronic form version 1.4