Abstract Submitted
for the MAS17 Meeting of
The American Physical Society

Third-order Nonlinearity of MoS_2 and WS_2 atomic Layers[1]
TIKARAM NEUPANE, SHENG YU, BAGHER TABIBI, FELIX JAETAE SEO, Hampton University — The third-order optical nonlinearity of 2D transition metal dichalcogenide atomic layers is of great interest for the prospective applications in optical modulators and photonic devices. The third-order nonlinearity includes the nonlinear absorption and nonlinear refraction which can be characterized through either resonant or non-resonant excitation. The atomic layers for this presentation include tungsten disulfide (WS_2) and molybdenum disulfide (MoS_2) nanoflakes of 1-4 layers in deionized water. The excitation wavelength was 532 nm which was located above A and B exciton absorptions of MoS_2 and between A and B exciton spectra of WS_2. The excitation at 2.33 eV is resonant for A and B excitons of MoS_2 and A exciton of WS_2, and the non-resonant for B exciton of WS_2. The nonlinear absorption coefficients for WS_2 and MoS_2 nanoflakes were analyzed to be ˜6.7 x 10^4 cm/GW and ˜-1.0x 10^5 cm/GW with open Z-scan, respectively. The nonlinear refraction of WS_2 and MoS_2 were estimated to be ˜- 6.7 x 10^{-10} cm^2/W and ˜-1.3 x 10^{-10} cm^2/W, respectively, with peak-valley nonlinear transmittance trace.

[1]This work is supported by ARO W911NF-15-1-0535, NSF HRD-1137747, and NASA NNX15AQ03A.

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Date submitted: 16 Sep 2017 Electronic form version 1.4