Abstract Submitted
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Photoluminescence polarization in monolayer WSe_2[1] A.T. HANBICKI, M. CURRIE, Naval Research Laboratory, G. KIOSEOGLOU, University of Crete, A.L. FRIEDMAN, B.T. JONKER, Naval Research Laboratory — Monolayer materials such as WS_2 or WSe_2 are direct gap semiconductors with degenerate, yet inequivalent k-points at K and K. The valence band maxima for K and K have spin states of opposite sense enabling one to selectively populate each valley independently with circularly polarized light. Subsequent valley populations can be determined via the polarization of emitted light. Optical emission is dominated by neutral and charged exciton (trion) features, and changes in emitted polarization provide insight into the fundamental processes of intervalley scattering. We measure the circular polarization of WSe_2 monolayers as a function of temperature and excitation energy for both continuous wave (cw) and pulsed lasers. We find the temperature dependence of the trion follows the same trend as that of the neutral exciton, however, the initial polarization of the trion is significantly larger. Indeed, when excited with a cw laser, the trion polarization is nearly twice the polarization of the neutral exciton. When a pulsed laser is used as the excitation source however, the initial polarizations become very similar. We discuss the similarities and differences in the spectra for these different excitation sources in terms of carrier densities and screening.

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