Abstract Submitted
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Synthesis and Optical Control of Circular Polarization in monolayer Tungsten Disulfide.[1] KATHLEEN MCCREARY, AUBREY HANBICKI, BEREND JONKER, MARC CURRIE, Naval Research Laboratory, GEORGE KIOSEOGLOU, University of Crete, Greece — The unique electronic band structure in single layer WS_2 provides the ability to selectively populate a desired valley by exciting with circularly polarized light. The valley population is reflected through the circular polarization of photoluminescence (PL). We investigate the circularly polarized PL in WS_2 monolayers synthesized using chemical vapor deposition (CVD). The resulting polarization is strongly dependent on the sample preparation. As-grown CVD WS_2 (still on the growth substrate) exhibits low polarized emission, regardless of laser excitation or laser power. Removing WS_2 from the growth substrate and repositioning on the same substrate significantly impacts the optical properties. In transferred films, the excitonic state is optically controlled via high-powered laser exposure such that subsequent PL is solely from either the charged exciton state or the neutral exciton state. Neutral excitonic emission exhibits zero polarization whereas the trion polarization can exceed 25% at room temperature. The removal process may modify the strain, sample-to-substrate distance, and chemical doping in the WS_2 monolayer, and work is underway to determine how these factors influence the valley populations. These results demonstrate a new method to control the excitonic state and PL polarization in monolayer WS_2. .

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