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Valley polarization and coherence in atomically thin tungsten disulfide via optical spectroscopy BAIREN ZHU, The University of Hong Kong, HUALING ZENG, The Chinese University of Hong Kong, JUNFENG DAI, South University of Science and Technology of China, ZHIRUI GONG, XIAODONG CUI, The University of Hong Kong — Atomically thin group-VI transition metal dichalcogenides (TMDC) has been emerging as a family of intrinsic 2-dimensional crystals with a sizeable bandgap, opening a potential avenue for ultimate electronics and optoelectronics. Besides, the characteristic structural inversion symmetry breaking in monolayers leads to non-zero but contrasting Berry curvatures and orbital magnetic moments at K/K' valleys. These features provide an opportunity to manipulate electrons' additional internal degrees of freedom, namely the valley degree of freedom, making monolayer TMDC a promising candidate for the conceptual valleytronics. Here, our experimental approach on valley dependent circular dichroism in monolayer and bilayer WS_2 via optical spectroscopy are elaborated. Consequently, the polarization of photoluminescence inherits that of excitations, circularly and linearly polarized, confirming the valley dependent selectivity rule. However, the valley polarization and valley coherence in bilayer WS_2 owing to the coupling of spin, valley and layer degrees of freedom, are anomalously robust compared with monolayer WS_2. We propose potential mechanisms of the anomalous behavior in WS_2 bilayers.

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