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Exploration of vertical dipole in 2D layered polar crystal JUN XIAO, HANYU ZHU, UC Berkeley, ANGYU LU, King Abdullah University of Science and Technology, YUAN WANG, UC Berkeley, LAIN-JONG LI, King Abdullah University of Science and Technology, XIANG ZHANG, UC Berkeley — Conventional two-dimensional (2D) transition metal dichalcogenide (TMD) monolayers such as MoS₂ have attracted huge interest for their unique valley and excitonic physics. Additional freedom in spin/valley manipulation and functionalization can be introduced by breaking out-of-plane mirror symmetry, but has yet been experimentally realized so far. Here we report first study on monolayer polar TMD. With advanced optical and mechanical characterization techniques, we demonstrated the presence of vertical dipole and related functionality in such synthetic polar crystal. Our work opens the way to achieve asymmetric TMD monolayer by design, providing an excellent platform for studying dipole-coupled physics and out-of-plane motion control at 2D limit.

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