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Electrical Tuning of Valley-Polarized Circular Photogalvanic Current in a Monolayer Transition Metal Dichalcogenide[1] LEI LIU, ERIK J. LENFERINK, TEODOR K. STANEV, NATHANIEL P. STERN, Department of Physics and Astronomy, Northwestern University, GUOHUA WEI, Applied Physics Program, Northwestern University — In a monolayer transition metal dichalcogenide that lacks structural inversion symmetry, the valley contrasting properties, particularly the magnetic moment and Berry curvature, offer the possibility to create a population imbalance between the two valleys simply with an external optical field[2]. With the circular photogalvanic effect, the generation of the spin-valley-coupled photocurrent has been demonstrated in chalcogenides[3]. Continuously tuning the valley-polarized current so far has remained largely unexplored in monolayer devices. Here we show the voltage-tunable photocurrent polarization can be achieved in monolayer MoS_2 where electric field facilitates the disassociation of excitons and the carrier drift. Gating that modulates the contact barrier and carrier density can switch the monolayer photocurrent polarization on and off with a large valley-polarized current on-off ratio greater than 10^3. The efficient electrical tuning of valley-polarized photocurrent opens new possibilities for exploiting polarized currents in monolayer semiconductor devices.

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[3] H. Yuan, *et al. Nat. Nanotechnol.* **9**, 851 (2014)

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