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Spin Hall effect in spin-valley coupled monolayers of transition metal dichalcogenides[1] WENYU SHAN, Department of Physics, Carnegie Mellon University, HAIZHOU LU, Department of Physics and Centre of Theoretical and Computational Physics, University of Hong Kong, DI XIAO, Department of Physics, Carnegie Mellon University — We study both the intrinsic and extrinsic spin Hall effect in spin-valley coupled monolayers of transition metal dichalcogenides. We find that whereas the skew-scattering contribution is suppressed by the large band gap, the side-jump contribution is comparable to the intrinsic one with opposite sign in the presence of scalar and magnetic scattering. Intervalley scattering tends to suppress the side-jump contribution due to the loss of coherence. By tuning the ratio of intra- to intervalley scattering, the spin Hall conductivity shows a sign change in hole-doped samples. The multiband effect in other doping regimes is considered, and it is found that the sign change exists in the heavily hole-doped regime, but not in the electron-doped regime.

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Wenyu Shan
Department of Physics, Carnegie Mellon University

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