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Two-dimensional Rashba Lead Chalcogenides PAUL HANAKATA, Boston University, ALEKSANDR RODIN, ALEXANDRA CARVALHO , National University of Singapore, HAROLD PARK, DAVID CAMPBELL, Boston University, ANTONIO CASTRO NETO , National University of Singapore — We study two-dimensional lead chalcogenides PbX (X=S, Se, Te) using first principle methods. Due to the heavy Pb element with strong spin-orbit coupling (SOC) and the broken inversion symmetry of its buckled monolayer structure, PbX is found to possess Rashba splitting with a relatively large Rashba coefficient $\alpha_{\mathrm{R}} \sim 1$ which is comparable to other giant Rashba materials (e.g BiTeBr). The direction of the buckling (polarization) can be switched and thus several critical properties such as the band gap, the Rashba coefficient, and spin projections can be controlled through applications of strain or an external electric field; this control is essential for developing multifunctional electronic devices. We develop a new tight-binding formulation to describe the band structure. Based on these results, we propose a new novel way to control spins through photo-excitations.

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