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Spin-orbit interaction in monolayer (group-III) metal-monochalcogenides PENGKE LI, IAN APPELBAUM, Univ of Maryland-College Park, PHYSICS DEPARTMENT TEAM — Beginning with an analysis of the fundamental symmetries of monolayer (group-III) metal-monochalcogenides (such as GaSe), we examine various spin-dependent properties of this new series of 2D semiconductors. Interesting features resulting from spin-orbit interaction include broken valence band degeneracy, cubic Dresselhaus spin splitting, and eigenstate spin-mixing. The latter two control the type and magnitude of dominant spin relaxation pathways and influence the 'caldera' shape valence band edge. Further phenomena endowed by spin-orbit interaction include a modest orbital contribution to the Lande g-factors and the possibility of optical orientation via band-edge photoexcitation spectroscopy, which shows an energy-dependent reversal of conduction electron spin polarization. Based on this analysis, we propose an experiment to use optically-driven spin dynamics to quantify different spin lifetimes for electron and holes. Reference: arXiv:1508.06963

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