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Induced spin orbit coupling in graphene by proximity to transition metal dichalcogenides monolayer[1] ABDULRHMAN ALSHARARI, SERGIO ULLOA, Ohio Univ, MAHMOUD ASMAR, Lousiana State University — Proximity effects resulting from depositing a graphene layer on a substrate may induce spin depend interactions that change the topological properties of graphene. A suitable candidate to study this effect is a transition metal dichalcogenides substrate. A 2D layer of these materials has a large SOC that in turn induces a sizable effect near the graphene Dirac points. Graphene and 2D TMDs are nearly commensurate lattices, producing an interesting moiré pattern when adhered to one another. We study theoretically the electronic structure of graphene-TMD systems using a tight binding formalism. We find that graphene exhibits a strong proximity SOC, in addition to other perturbations that strongly affect the states; the linear dispersion near the neutrality point becomes gapped. Based on symmetries allowed by the heterostructure, we find the effective Hamiltonian to describe the low energy states. We find that diagonal SOC and staggered potential terms characterize the wave functions, akin to the structure in TMDs. A relative voltage between the layers enhances the proximity SOC in graphene, providing a tunable effect that may impact the optoelectronic properties of the system.

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