Tuning the spin-orbit coupling in twisted graphene/TMDC heterostructures: spintronics meets twistronics

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Multilayer stacks of two-dimensional materials have become an important platform for quantum simulators, which aim to explore a wide range of exciting quantum phenomena[1]. The proximity induced spin-orbit coupling (SOC) plays a pivotal role in many of these systems. We have shown[2] that the interlayer twist angle can be used to enhance the strength of the induced SOC in graphene/transition metal dichalcogenide (TMDC) bilayers. We have also found that the proximity induced Rashba SOC can be affected by quantum interference effects in twisted trilayers. We have calculated the quantum phase responsible for this effect in graphene/TMDC bilayers as a function of interlayer twist angle. We showed how this quantum phase affects the spin-polarization of the graphene bands and discuss its potential effect on spin-to-charge conversion measurements.

References

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