Atomic Scale Quantum Anomalous Hall Effect in Monolayer Graphene/$MnBi_2Te_4$ Heterostructure

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The two-dimensional quantum anomalous Hall (QAH) effect is direct evidence of non-trivial Berry curvature topology in condensed matter physics. So far, the QAH effect has exclusively been observed in magnetic topological materials. Searching for QAH in 2D materials with the advantage of thinner thickness and easier fabrication emerges as a crucial challenge in future applications. In this talk, we propose the QAH effect in graphene/$MnBi_2Te_4$(MBT) heterostructure based on density-functional theory. The monolayer MBT introduces intrinsic spin-orbital coupling, Kekulé distortion, and exchange Zeeman field on graphene, resulting in a Chern insulating phase with C=1 in covered monolayer graphene. Our effective Hamiltonian further presents a fruitful phase diagram that has never been studied previously. Our work provides a new and practical way to explore the QAH effect in monolayer graphene and the magnetic topological phases by the flexibility of MBT family materials.