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ENGINEERING A ROOM-TEMPERATURE SPIN HALL STATE IN GRAPHENE VIA ADATOM DEPOSITION

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ABSTRACT:

Using symmetry arguments, density functional theory, and tight-binding simulations, we predict that graphene endowed with certain heavy adatoms realizes a two-dimensional topological insulator phase with substantial band gap. For indium and thallium, our most promising adatom candidates, a modest coverage of 6% produces an estimated gap near 80K and 240K, respectively, which should be detectable in transport or spectroscopic measurements. Engineering such a robust topological phase in graphene could pave the way for a new generation of devices for spintronics, ultra-low-dissipation electronics and quantum information processing.