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Heavy Adatoms on Magnetic Surfaces: A Search for Chern Insulators KEVIN GARRITY, DAVID VANDERBILT, Rutgers University — The theoretical possibility of a quantum anomalous Hall (QAH) insulator, or Chern insulator, has been known for many years, and several strategies for achieving this topological phase have been proposed. However, no unambiguous experimental realization is yet in hand. In this work, we propose a new QAH search strategy and verify its viability with first-principles calculations. We propose constructing a QAH insulator by depositing a layer of adatoms with large spin-orbit coupling (e.g., Pb, Bi) on the surface of a magnetic insulator. We argue that such systems will typically have surface bands with non-zero Chern numbers, so that if metallic, they will typically have a large anomalous Hall conductivity. Thus, the search for Chern insulators reduces to looking for examples exhibiting a global gap across the entire BZ. Using first-principles calculations, we search through many examples of heavy elements on MnTe, MnSe, and EuS surfaces. Our search reveals several Chern insulators with band gaps of up to 0.14 eV, which may be promising targets for future experimental investigations.

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