Prediction of 2D ferromagnetic metal VNI monolayer with tunable topological Properties

Wei Ren  
renwei@shu.edu.cn

Keywords: Topological nodal line crystal, Ferromagnetism, Strain engineering

Two-dimensional (2D) ferromagnetic topological semi-metals have attracted much interest\(^1\-\(^3\) owing to their fascinating spintronic applications\(^4\,\(^5\). Using first-principles calculations, we propose a stable transition metal nitrogen halide crystal namely VNI monolayer\(^6\), to display intrinsic ferromagnetism with high Curie temperature \(T_C\) (~510 K) and strong out-of-plane magnetism. It is found to be a topological Weyl nodal line material, which can be fully spin polarized by controlling the on-site Coulomb interaction. Its nodal line can be destroyed by orienting the magnetization axis. Additionally, the biaxial strain enables efficient tuning of the magnetic properties by switching the easy magnetic axis from out-of-plane to in-plane direction with an enhanced \(T_C\) to 540 K. These results highlight the great application potential of VNI monolayer in low-dimensional topological magnets.

Reference