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Topological semimetal phase in half-metallic GdN

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GdN is a ferromagnetic rocksalt material close to a transition between an insulator and a half-metallic state. In the latter state, crossings between unoccupied Gd 5d and occupied N 2p bands produce a population of Weyl points that characterize GdN as a topological semimetal. The band structures near these crossing points exhibit additional notable features, including unusual dispersions and nearly degenerated bands, which are discussed in terms of the presence of distinct energy scales associated with the spin-orbit coupling of the heavy Gd and the light N atoms. We investigate the origin of these unusual band features and their evolution upon external parameters such as pressure and magnetic-moment direction, as well as the resulting Fermi arc surface states.

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