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Nearly triple point topological phase in half-metallic GdN JINWOONG KIM, HEUNG-SIK KIM, DAVID VANDERBILT, Rutgers Univ — Recent developments in topological semimetals open a way to realize relativistic high-energy particles inside a condensed matter system. For instance, two-fold and four-fold degenerate band crossing points in the momentum space behave as Weyl and Dirac Fermions, respectively. One of the lately studied topological particles is the triple point which is a three-fold degenerate band crossing point. By employing *ab-initio* tight-binding calculations, we investigate topological phases of half-metallic GdN. The crossing points between valence and conduction bands are found to be the type-I triple points in the absence of the spin-orbit coupling. By introducing the spin-orbit coupling, the degeneracy of the triple points is lifted where the amount of splitting depends on the direction of the net magnetic moment. Upon the magnetic moment direction, it ranges from Weyl semimetal to "nearly triple point" phase. The latter phase is revealed to induce apparently equivalent surface states to that of a true triple point. Therefore, half-metallic GdN is a good platform to investigate the triple point phase with rich topological surface states manipulable via the magnetic moment.

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