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Topological superconductivity in an ultrathin, magnetically-doped topological insulator proximity coupled to a conventional superconductor[1] YOUNGSEOK KIM, TIMOTHY M. PHILIP, MOON JIP PARK, MATTHEW J. GILBERT, University of Illinois at Urbana and Champaign, UNIVERSITY OF ILLINOIS AT URBANA AND CHAMPAIGN TEAM — As a promising candidate system to realize topological superconductivity (SC), 3D time-reversal invariant topological insulators (TI) proximity-coupled to s-wave superconductors have been intensively studied. Recent experiments on proximity-coupled TI have shown that superconductivity may be induced in ultrathin TI. One proposal to observe the topological SC in proximity-coupled ultrathin TI system is to add magnetic dopants to the TI[2]. However, detailed study on the impact of the experimental parameters on possible topological phase is sparse. In this work, we investigate ultrathin, magnetically-doped, proximity-coupled TI in order to determine the experimentally relevant parameters needed to observe topological SC. We find that, due to the spin-momentum locked nature of the surface states in TI, the induced s-wave order parameter within the surface states persists even at large magnitudes of the Zeeman energy, allowing us to explore the system in parameter space. We elucidate the phase diagram as a function of: the hybridization gap, Zeeman energy, and chemical potential of the TI system. Our findings provide a useful guide in choosing relevant parameters to facilitate the observation of topological SC in thin film TI-superconductor hybrid systems.

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