MAGNETISM AND HALL EFFECTS IN THIN FILMS OF TOPOLOGICAL INSULATORS

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Topological insulators (TIs) are narrow–gap semiconductors characterized by Dirac-like surface state and protected by time-reversal symmetry. Magnetic field (external or internal) breaks this symmetry and causes splitting of the topological surface state at the Dirac point thus making the surface insulating.
Internal magnetic field in TIs can be create in various ways, in particular, by introducing vacancies or carbon atoms [1], doping with 3d-transition metal atoms [2], displaying magnetic semiconductors or organic overlayers as well as bulk materials on the surface of three- or two-dimensional TIs [3-5].

Here we present and discuss recent results of the study of magnetic impurities as well as magnetic proximity effects on electronic and spin structure of TIs and splitting of the topological surface state. We propose a method for engineering of heterostructures that result systematically in big splitting of the Dirac cone. We also analyze magnetic effects in two-dimensional topological insulators and heterostructures and discuss recent results for quantum spin and anomalous Hall effects [6,7].

Keywords: Topological insulators; Dirac surface states; ferromagnetism; Hall effects

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