Tata Institute of Fundamental Research
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Internal Seminar

Proximity-Induced Magnetism at the Interface between a Topological Insulator and a Ferromagnetic Insulator

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Topological insulator (TI) is a bulk electrical insulator with a two-dimensional metallic surface. Such three-dimensional topological insulators exhibit conducting surface states (SSs) which are protected by time-reversal symmetry (TRS). The linear dispersion of the gapless SSs with the locking of the spin and momentum, degree of freedom is preserved as long as timereversal symmetry is not broken. The short-range nature of magnetic proximity coupling with a ferromagnetic insulator (FMI) allows these TI conducting states to experience the exchange fields, breaking the TRS, which should translate into magnetic signatures in electrical transport. Introducing ferromagnetic order right at the interface into a topological insulator leads to the realization of several predicted physical phenomena like Quantum Hall effect (QHE), topological magnetoelectric effect, and topological superconductivity. These interface phenomena provide new opportunities for creating next generation electronic, spintronic and quantum computation devices. I report our experimental efforts on epitaxial growth of thin (5 nm) films of Bi_2Se_3 for fabricating such hybrid structure devices with a FMI. Bi_2Se_3 films were successfully grown by controlling the substrate temperature (T_S) and flux ratios (Se/Bi) using co-evaporation method in the MBE chamber. The structural studies (RHEED, XRD and RAMAN) on Bi_2Se_3 reveal the formation of single phase hexagonal phase with space group $R\bar{3}m(D_{3d}^5)$. In this talk, I will discuss our recent experimental efforts in epitaxial growth of pseudo 2D TI films and the future approach towards understanding and to develop a device based on proximity-induced magnetism/superconductivity at such hybrid interfaces.

Friday, Feb 09th 2018

02:00 PM (Tea/Coffee at 01:30 PM)

Seminar Hall, TIFR-H