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Search for induced surface superconductivity and defect structure in ion implanted topological insulators Bi_2Se_3, Bi_2Te_3 and Iron Chalcogenides Fe (Se/Te) Single Crystals[1] KALYAN SASMAL, DHARSHANA WIJESUNDERA, IRENE RUSAKOVA, WEI-KAN CHU, JOHN H. MILLER, Department of Physics and TcSUH, University of Houston, ZHONG TANG, ARNOLD GULOY, Department of Chemistry and TcSUH, University of Houston, DEPARTMENT OF CHEMISTRY AT UNIVERSITY OF HOUSTON COLLABORATION — Topological superconductors represent a newly predicted phase of matter which is topologically distinct from conventional superconducting condensates of Cooper pairs. Electronic properties of Bi_2 X_3 topological insulators and Iron Chalcogenides FeX can be tuned by ion implantation. The defect structure of implanted Bi_2X_3 and FeX are studied using TEM analysis. This study presents an unprecedented route in inducing possible surface superconductivity in Bi_2Se_3, Bi_2Te_3, Fe (Se/Te) single crystals by ion implantation and the effect of ion implantation into spin-density wave (SDW) anomaly of Fe (Se/Te) single crystals studied using resistivity measurements. Due to the shallow implantation depth of the ions, the observed superconductivity is in principle confined to the surface or sub-surface level, and the normal state can be recovered by thermal annealing and annealing facilitates the tuning of the carrier concentrations in Bi_2X_3, FeX crystals to allow the study of surface transport associated with the topological surface states in Bi_2X_3.

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