S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter Physics and Material Sciences

05th January'2022 **4.00PM** **ONLINE**

SPEAKER

Dr. Surjeet Singh
Associate Professor, IISER Pune

TITLE OF THE TALK

Impurities as a probe for determining the superconducting order parameter

ABSTRACT

Based on a variety of experiments, we currently have good reasons to believe that the gap symmetry in the so-called '122' family of iron-based superconductors is of s-type. However, due to the multiband nature of the superconductivity in these systems, the question of whether the gap symmetry is s_{++} or $s_{\pm}$ has remained as yet unsettled. Here, I will first present the difficulties involved in solving this problem and how impurities can serve as a probe and shed light on this issue. The T_C suppression rate due to magnetic (Mn) and non-magnetic (Zn) impurities will be considered in the optimally electron-doped superconductor $Sr(Fe_{0.88}Co_{0.12})_2As_2$ superconductor. We show that in an as-grown $Sr(Fe_{0.88}Co_{0.12})_2As_2$ crystal the T_C suppression rate due to magnetic (Mn) impurities is ~ 35 mK/μΩcm. However, after prolonged annealing at low temperature, which supposedly heals the point-like crystallographic defects, the T_C suppression rate increases to ~ 325 mK/μΩcm, which we infer as the actual T_C suppression rate due to Mn impurities. These findings are then shown to support the s_{++} pairing symmetry in the optimally electron-doped $SrFe_2As_2$. The experiments with non-magnetic Zn-impurities confirm this assertion where the non-magnetic Zn impurity doping is found to not suppress but enhance the T_C upon annealing.

HOST FACULTY

Dr. Thirupathaiah Setti

Assistant Professor & Seminar Coordinator, CONDENSED MATTER PHYSICS AND MATERIAL SCIENCES

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