Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Webinar

In pursuit of structure-magnetism correlation in Cr-doped (Sr/Ca)RuO_3: from bulk to thin film

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In quest of high temperature superconductivity without copper, ruthenates were also explored and triplet superconductivity (with equal spin paring) below 1.5 K was discovered in Sr_2RuO_4. Sr_2RuO_4 is a part of the Ruddlesden popper series [$(Sr/Ca)_{1+n}Ru_nO3_{n+1}$, where n stands for the number of RuO_6 octahedral layers in the perovskite-like stack] with n=1. They all are a type of perovskite oxides. For an infinite number of layers, this becomes $SrRuO_3$($CaRuO_3$), which is an itinerant ferromagnetic (paramagnetic) metallic system.

The physical properties get altered upon transition metal doping at the Ru Site in perovskite Ruthenates (Sr/$CaRuO_3$). Particularly in $SrRuO_3$ (T_C~160 K), transition metal ions (TMIs): Zn^{2+}, Mn^{3+}, Co^{2+}, Ni^{2+}, and Ti^{4+} doping suppresses the T_C down to 100 K. Doping Cr is an exceptional case (among TMIs) that enhances the T_C of $SrRuO_3$ up to ~190 K. However, the origin of such enhancement was not explored. While in $CaRuO_3$, Cr-doping is an interesting case as it induces stronger ferromagnetism than doping with same amount of Fe. In order to find the reason behind such enhanced ferromagnetism in Cr-doped case we have performed a detailed structural, spectroscopic, magnetic, temperature-dependent neutron diffraction and neutron depolarization analysis of the Cr-doped Sr/$CaRuO_3$ compound. Further, 15% Cr-doped Sr/$CaRuO_3$ thin films of various thicknesses were grown using PLD to study the role of interfacial strain and doping on the magnetism and magnetotransport properties of the system.

Friday, May 30th 2025

11:30 Hrs