Half metallicity in Fe-Ti-Sn Heusler alloys:

The next generation memory devices are expected to be based on exploiting the "spin" aspect of the charge carriers in electronic transport. Until now, spin polarized electronic structure was claimed only for Co based Heusler alloys. Sayan Chaudhuri and Preeti Bhobe at IIT Indore have demonstrated a spin-polarized DOS in a Fe-based Heusler alloy, qualifying it to be a potential Half Metallic system.

Fe_2TiSn has high probability of anti-site disorder between Fe and Ti, which controls the ground state magnetic and transport properties. This group developed a method to decrease this anti disorder by substituting higher electronegative atom at Sn site. This method successfully decreased the anti-site disorder, and also created a strong polarization of the states that are dominant at Fermi-level. While the resistivity shows a metallic temperature dependence for Fe_2TiSn, Sb substitution causes this behavior to change to semiconductor-like. Mott variable range hopping of electrons is found to be responsible for such anomaly in transport properties. Combined analysis of the electrical resistivity and hall effect measurements indicate that we realized a half metallic ground state in our studied compositions. Our electronic structure calculation further supports our claim.
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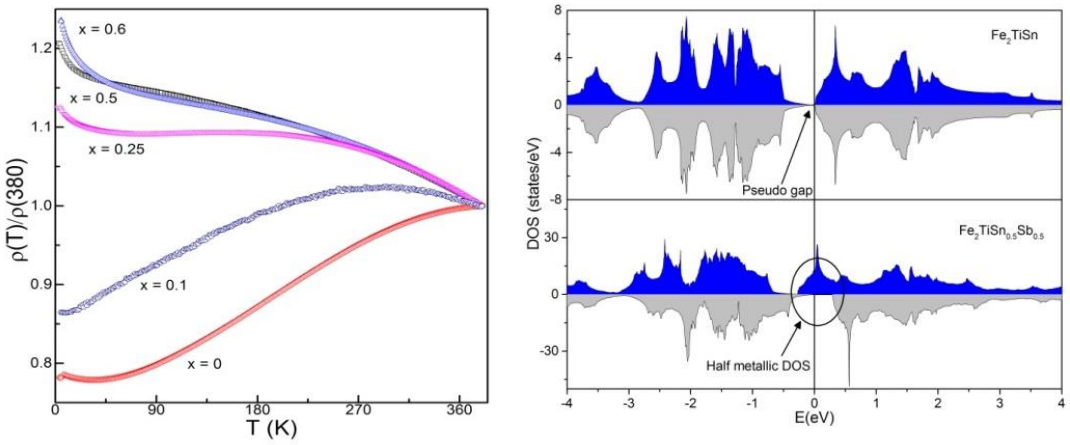
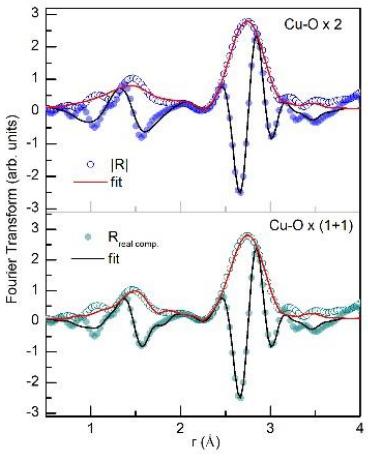


Local crystal structure of p-type Transparent conducting oxide:



$CuCrO_2$ belongs to the delafossite oxide family of compounds, characterized by layered structure in the *ab*-plane and *c*-axis that is roughly 7 times longer than the a-axis. Presence of magnetic ions Cr^{3+} ($3d^3$, $S = 3/2$) in a frustrated triangular lattice that ultimately orders antiferromagnetically below 24K. High optical band gap of 3.2 eV with holes as the majority charge carriers, identifies $CuCrO_2$ as the *p*-type transparent conducting oxide. Mithun Majee and Preeti Bhobe, at IIT Indore, investigated the local crystal structure of this interesting material using temperature dependent XAFS, identifying the exact nature of hybridization between Cu and Cr ions. Interestingly, two separate Cu-O correlations were found along the linear O-Cu-O linkage along the *c*-axis. While CrO_6 octahedra are not much distorted.

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