Highlights

Superconductivity - 2016

Research Update: Structural and transport properties of (Ca,La)FeAs2 single crystal

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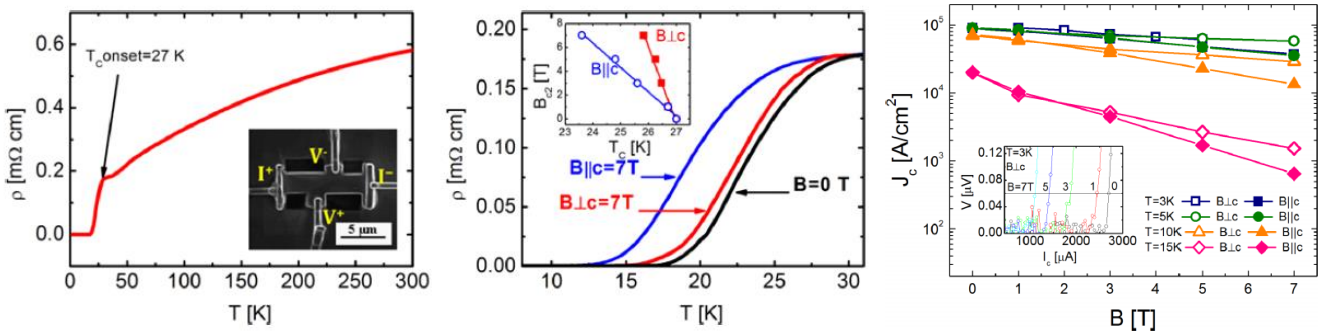
Structural and transport properties in the normal and superconducting state are investigated in a $Ca_{0.8}La_{0.2}FeAs_2$ single crystal with T_c=27 K, belonging to the newly discovered 112 family of iron based superconductors. The transport critical current density J_c for both field directions measured in a focused ion beam patterned microbridge reveals a weakly field dependent and low anisotropic behaviour with a low temperature value as high as $J_c(B=0)=10^5$ A/cm^2. This demonstrates not only bulk superconductivity but also the potential of 112 superconductors towards applications. Interestingly this superconducting compound undergoes a structural transition below 100 K which is evidenced by temperature-dependent X-ray diffraction measurements. Data analysis of Hall resistance and magnetoresitivity indicate that magnetotransport properties are largely dominated by an electron band, with a change of regime observed in correspondence of the onset of a structural transition. In the low temperature regime, the contribution of a hole band to transport is suggested, possibly playing a role in determining the superconducting state.



Left: Resistivity vs *T* measurement of a $Ca_{0.8}La_{0.2}FeAs_2$ single crystal. Inset: IB image of the FIB patterned crystal. **Center :** Resistivity transition for magnetic fields B=0 and B=7T, applied both parallel (B‖c) and perpendicular (B ⊥ c) to the *c*-axis. Inset: B_{c2} vs T_c up to B_{c2}=7T for B‖c and B ⊥ c. ***Right:*** Transport J_c measurements at fixed temperatures as a function of B‖c and B ⊥ c. Inset: V-I curves measured at T=3K at different perpendicular (B^c) fields