Magneto-transport properties and thermally activated flux flow in Ba(Fe$_{0.91}$Co$_{0.09}$)$_2$As$_2$ superconductor

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At the onset of the resistivity knee, fluctuations not related to the Anderson-Kim TAFF model, give rise to initial resistivity. The Arrhenius description of TAFF does not work well there and a better quantitative model needs to be developed.

The onset of TAFF temperature and the crossover temperature $T_x$ from TAFF to flux flow are determined. Considerable flux penetration appears even in the zero resistivity state, in addition to ac losses.

Hence, we determine the flux flow activation energies $U$ of Ba(Fe$_{0.91}$Co$_{0.09}$)$_2$As$_2$ bulk superconductor as a function of magnetic field and temperature.

We determine $H$-$T$ phase diagram with particular emphasis on the limitations of The Anderson-Kim TAFF regime and the weak pinning state.