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Title: Superconductivity and transport in ferroelectric metals

Abstract:

We propose a theoretical model of a ferroelectric metal where spontaneous electric polarization coexists with the conducting electrons. In our model we adopt a scenario when conducting electrons interact with two soft transverse optical phonons, generalize it to the case when there is a spontaneous ferroelectric polarization in the system, and show that a linear coupling to the phonons emerges as a result. We find that this coupling results in anisotropic electric transport which has a transverse to the current voltage drop. Importantly, the obtained transverse component of the resistivity has distinct linear dependence with temperature. Moreover, we show that the coupling enhances superconducting transition temperature of the ferroelectric metal. We argue that our results help to explain recent experiments on ferroelectric strontium titanate, as well as provide new experimental signatures to look for.