Electronic properties across the first-order phase transition in $Fe_{1.05}Te$

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We present here resistivity, magnetization, specific heat, scanning tunneling microscopy, and spectroscopy (STM/S) studies on $Fe_{1.05}Te$ single crystals grown by a horizontal Bridgman method. In this compound, the superconductivity appears upon Se substitution and the physical properties are found to be extremely sensitive to non-stoichiometry and disorder [1]. In our crystals, a first-order phase transition is observed around 57 K in the resistivity, magnetization and the specific heat measurements. This transition is associated with a structural change from the tetragonal P4/nmm to the monoclinic P 2_1/m space group. At this temperature, the compound becomes antiferromagnetic and the temperature dependence of the resistivity changes from log (-T) to T^2. This observation suggests that the material becomes a Fermi-liquid metal at low temperatures. Metallic behavior is also confirmed in the I-V characteristics of the STM measurements taken on an atomically resolved surface.
[1] S. Rößler *et al.*, Phys. Rev. B, **82** 144523(2010).