Electrical Transport Properties of Vanadium-doped $Bi_2Te_{2.4}Se_{0.6}$

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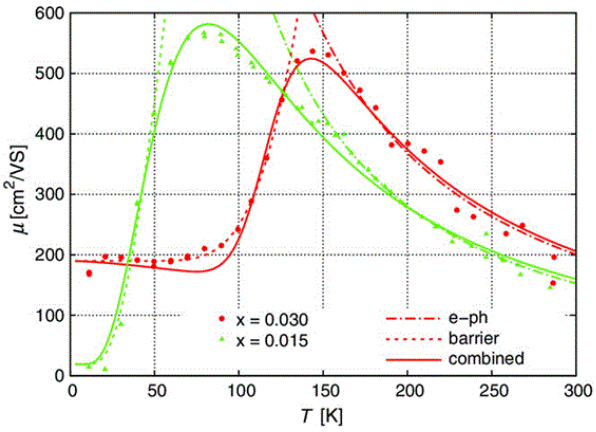
Short Abstract

Topological insulators (TIs) are of high interest regarding spintronics and quantum computing. Vanadium-doped $Bi_{2-x}Te_{2.4}Se_{0.6}$ single crystals (x = 0.015 and 0.03) are investigated with respect to electrical resistivity, charge carrier concentration, and mobility. Band structure characterisation shows gapless topological surface states for both vanadium concentrations. The Van-der-Pauw resistivity, the Hall charge carrier density, and the mobility in the temperature range from 0.3 to 300 K are strongly dependent on the vanadium concentration and constantly below 10 K. Magnetoresistance shows weak antilocalisation for both concentrations.



Above. Fits of the mobility as a function of temperature for $V_xBi_{2-x}Te_{2.4}Se_{0.6}$ crystals with x = 0.015 and x = 0.03. The dash‑dotted lines are fits to electron–phonon (deformation potential) scattering, with a −3/2 dependence.