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Highly mobile carriers in iron-based superconductors

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Abstract

© 2017 IOP Publishing Ltd Printed in the UK. The field and temperature dependencies of the resistivity and Hall effect are measured for FeSe 1-x S x (x = 0.04, 0.09, and 0.19) single crystals. Sample FeSe0.81S0.19 does not show a transition to an orthorhombic phase and at low temperatures exhibits transport properties, which are very different from those of orthorhombic samples. The behavior of FeSe0.81S0.19 is well described by the simple two-band model with comparable values of the hole and electron mobilities. The characteristics of the low-temperature transport properties of the orthorhombic Fe(SeS) samples are largely determined by the presence of a small number of highly mobile carriers, which may originate from the local regions of the Fermi surface, presumably, nearby the Van Hove singularity points. Our results, for the first time, demonstrate a strong evolution of a tiny band of highly mobile electrons at a tetragonal to orthorhombic quantum phase transition. The behavior of this band can be the reason for the diverging nematic susceptibility, determined from elastoresistivity, which is considered one of the most intriguing phenomena in the physics of iron-based superconductors.

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Keywords

Hall effect, iron-based superconductors, magnetoresistance, nematicity, phase transitions

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