

Correlation between the Anomalous Properties and the Low Temperature Structural Distortion in β -FeSe

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The discovery of Superconductivity in the tetragonal phase β -FeSe provides a unique platform for the detailed investigation of the correlation between the physical properties and crystal structure to better understand the possible origin of superconductivity in the new iron-based superconductors. We have carried out a series of properties characterizations by measuring resistivity, magnetic susceptibility, Raman, NMR and femtosecond spectroscopy on β -FeSe single crystals grown by flux-melt or high-pressure synthesis. Our results show clearly the presence of anomalies in all the characterized properties at the temperature where a structural distortion from tetragonal to orthorhombic (or monoclinic) appears for all superconducting samples, but not in the non-superconducting ones. This structural distortion was observed not accompanied by a magnetic ordering as commonly occurs in the parent compounds of FeAs-based superconductors. All the observations suggest that the low temperature structural distortion is essential for the occurrence of superconductivity in β -FeSe. Details of the experimental results will be presented and discussed

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