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Microstructure and Excess Conductivity of Bulk, Ag-Added FeSe Superconductors

Authors : Michael Koblischka, Yassine Slimani, Thomas Karwoth, Anjela Koblischka-Veneva, Essia Hannachi

Abstract : On bulk FeSe superconductors containing different additions of Ag, a thorough investigation of the microstructures was performed using optical microscopy, SEM and TEM. The electrical resistivity was measured using four-point measurements in the temperature range 2 K ≤ T ≤ 150 K. The data obtained are analyzed in the framework of the excess conductivity approach using the Aslamazov-Larkin (AL) model. The investigated samples comprised of five distinct fluctuation regimes, namely short-wave (SWF), onedimensional (1D), two-dimensional (2D), three-dimensional (3D), and critical (CR) fluctuation regimes. The coherence length along the c-axis at zero-temperature (ξc(0)), the lower and upper critical magnetic fields (Bc1 and Bc2), the critical current density (Jc) and numerous other superconducting parameters were estimated with respect to the Ag content in the samples. The data reveal a reduction of the resistivity and a strong decrease of ξc(0) when doping the 11-samples with silver. The optimum content of the Ag-addition is found at 4 wt.-% Ag, yielding the highest critical current density.

Keywords : iron-based superconductors, FeSe, Ag-addition, excess conductivity, microstructure
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