Magnetic and electric characterization of bulk FeSe superconductors with Ag addition

T. Karwoth[1], X. L. Zeng[1], K. Furutani[1,2], A. Wiederhold[1], M. R. Koblischka[1], M. Muralidhar[2], M. Murakami[2] and U. Hartmann[1]
[1]Institute of Experimental Physics, Saarland University, Campus C 6 3, D-66123 Saarbrücken, Germany
[2]Superconducting Materials Laboratory, Department of Materials Science and Engineering, Shibaura Institute of Technology, 3-7-5 Toyosu, Koto-ku, Tokyo 135-8548, Japan

Superconductivity of bulk FeSe samples was characterized through magnetic and electric measurements. In order to improve the superconducting properties, the sintering temperature was varied up to 900 ^{o}C and to improve the connectivity, silver was applied in low concentrations to the samples ranging from 0 to 7%. The electric properties of the samples were investigated by the four point probe method (*R-T* measurement and *V-I* characteristics). Generally, the sample with 4% Ag addition showed the highest critical transition temperature among all the samples with the same preparation parameters. The critical currents were estimated from *V-I* measurements in various magnetic fields up to 6 T.
The magnetic properties (*M-T* and *M-H*) of the samples were measured using an extraction magnetometer in a Quantum Design PPMS with fields up to 7 T. The critical current densities and the flux pinning forces were estimated using the extended Bean model, extending the work published in [1]. The scaling of normalized volume pinning force versus the reduced field indicated a peak position at 0.4 for the pure FeSe sample sintered at 900 ^{o}C, which points to a δT_c-pinning type. The improved flux pinning and the high critical current densities are attributed to the textured microstructure of the material.

[1] M. Muralidhar et al., Phys. stat. solidi (a), DOI 10.1002/pssa.201600299.