

FeSe Superconducting Tapes with High Critical Current Density Fabricated by Diffusion Method

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The high T_c value and the very high upper critical fields H_{c2} in iron-based layered superconductors have demonstrated that these materials may be competitive with A15, MgB₂ and even with high- T_c cuprate superconductors. Favorable characteristics of FeSe and FeTe_{1-x}Se_x (11 system) are not only the H_{c2} but also the low toxicity of their starting materials compared to the FeAs-based superconductors. Several FeSe and FeTe_{1-x}Se_x wires and tapes have been reported.^{1,2} For tapes or single-core wires of 11 system, critical current density is restricted to 350 A/cm². With diffusion method, we have fabricated FeSe superconducting tapes. The structural and superconducting properties are studied by the measurements of X-ray diffraction, scanning electronic microscopic images, electrical resistivity, current-voltage characteristics, and magneto-optical images. The transport critical current density J_c as high as 600 A/cm² at 4.2 K under zero field has been obtained. This value is almost twice larger than the reported values in FeSe single-core wires or tapes. This simple diffusion method is promising and can be extended into FeTe_{1-x}Se_x system.

¹T. Ozaki *et al.*, arXiv:1103.3602 (2011).

²Z. S. Gao *et al.*, arXiv:1103.5304 (2011).