Fabrication of high performance iron-based superconducting wires over 1000 meter length

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Abstract

Iron-based superconductor (IBS), which was discovered in 2008, has garnered significant attention from the global scientific community. Characterized by a high upper critical field and small anisotropy, IBS has been regarded as a prospective candidate material for high magnetic field applications, such as nuclear fusion reactors and next-generation particle accelerators. For such applications, it is essential to develop iron-based superconducting wires with high in-field critical current density (J_c). From the view of material microstructure, high-density of superconducting core and high-degree of grain texture are necessary for high transport current. In the past years, the J_c of IBS wires has been improved quickly, which reaches 2.6×10^5 A/cm^2 (4.2 K, 10 T). At the same time, 100 m length IBS wires have been successfully fabricated, and the J_c reaches 10^5 A/cm^2 (4.2 K, 10 T). In this report, we will summarize the fabrication technique of iron-based superconducting wires, and discuss the key factors governing the current transport properties. At the same time, the fabrication process of IBS wires over 1000 meter length will be presented. We hope that our work can contribute to advancing the application of IBS wires in high magnetic field region.

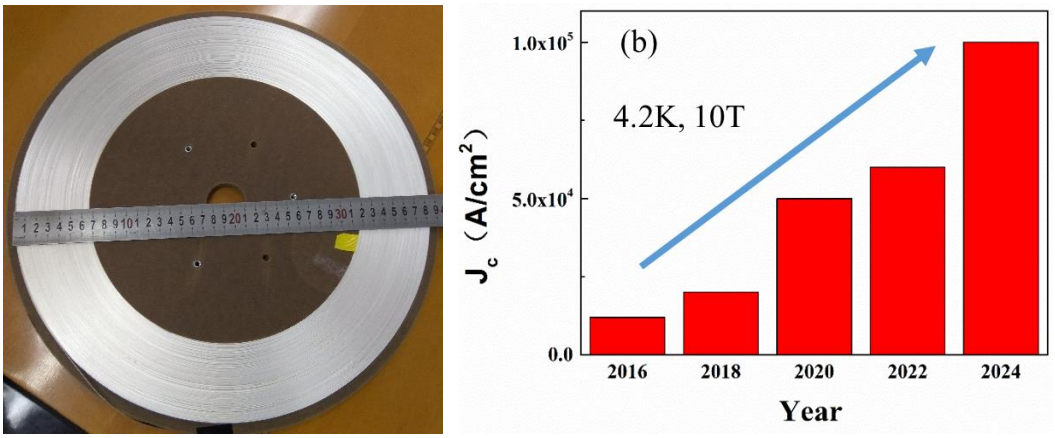

Figure 1 IBS long wires: a) picture of a long wire, b) J_c of long wires at different time

References

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Keywaords: Superconductor, IBS, wire, Critical Current density