Contribution ID: **897** Contribution code: **THU-PO3-605-10** Type: **Poster**

Synthesis and Current Transport Properties of Ba(Fe,Co)2As2 Polycrystalline Bulks Prepared by Spark Plasma Sintering

Thursday, 18 November 2021 10:00 (20 minutes)

BaFe2As2 (Ba122) is one of the parent materials of iron-based superconductors, and superconductivity can be induced by elemental substitution. Ba122 is expected to be used for high field applications since it has a high critical temperature Tc and upper critical field Hc2. In addition, Ba122 is suitable for the fabrication of polycrystalline materials owing to a relatively large critical grain boundary angle (θc = 5-9°[1]). On the other hand, microstructural control is required for improving critical current density Jc of Ba122. In this study, Co-doped Ba122 polycrystalline bulks were synthesized under various sintering conditions by SPS (Spark Plasma Sintering), which is a field-assisted, high-pressure sintering method. The bulk density, phase purity, microstructure, and superconducting properties were evaluated. The Ba122 phase was obtained as the main phase and the relative density of the samples was over 90%. Tc measured by electrical resistivity was above 27 K, exceeding that of single crystal (Tc = 26 K[2]), and Jc calculated from magnetic hysteresis loop exceeded 2.0×10^4 A/cm2 at 5 K under self-field.

References
[1] T. Katase et al.: Nature Communications, 2 (2011) 409
[2] Y. Nakajima et al.: J. Phys. Soc. Jpn., 78 (2009) 023702

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Session Classification: THU-PO3-605 MgB2 and Iron-based Wires and Cables