WBP1-2

Superconducting Properties of Polycrystalline $Ba_{0.6}K_{0.4}Fe_2As_2$ Bulks Fabricated by a Spark Plasma Sintering Method

*Kohei Nakagawa[1], Tomoyuki Naito[1], Hiroyuki Fujishiro[1]

Faculty of Science and Engineering, Iwate University, Japan[1]

Iron-based superconductors are expected to be applied in high magnetic fields, because it has a high superconducting transition temperature T_c and a high upper critical magnetic field H_{c2}. (Ba, K)Fe_2As_2 (T_c = 38 K for the optimal composition) is known to have a small electromagnetic anisotropy compared to the cuprate superconductors, therefore the polycrystalline samples, which were prepared by a powder-in tube [1] or a hot isostatic pressing (HIP) [2] methods, showed the relatively high critical current density. In this study, we attempted to produce the (Ba, K)Fe_2As_2 bulk by a spark plasma sintering (SPS) method and measured the superconducting properties.

Precursor powder of $Ba_{0.6}K_{0.4}Fe_2As_2$ was prepared by heating stoichiometric mixtures of pure Ba, K, Fe and As enclosed in the stainless steel tube under an atmosphere of pure gas argon. The obtained $Ba_{0.6}K_{0.4}Fe_2As_2$ powder was confirmed as the single phase by the powder X-ray diffraction method, and was sintered by the SPS method to produce a disk with a diameter of 10 mm and a thickness of 4 mm.

From the results of DC magnetic susceptibility, the onset of T_c was 35.0 K and the volume fraction of superconduction was 32.8 % at 5 K for the SPS-processed $Ba_{0.6}K_{0.4}Fe_2As_2$ bulks. A somewhat lower T_c suggested that the K substitution for the Ba-site might be incomplete. Thus, the optimization of the sample preparation such as the nominal composition of precursor powder and firing condition is now in progress.

[1] Z. Gao *et al.*, Supercond. Sci. Technol. **30** (2017) 095012.
[2] J D Weiss *et al.,* Supercond. Sci. Technol. **28** (2015) 112001.

Keywords: iron-based superconductors, Ba0.6K0.4Fe2As2, spark plasma sintering method