WBP9-5

Superconducting Joint Between $Ba_{1-x}K_xFe_2As_2$ Tapes by Using a Cold-press Technique

*Shota Imai[1,2], Shigeyuki Ishida[2], Yoshinori Tsuchiya[2], Akira Iyo[2], Hiroshi Eisaki[2], Taichiro Nishio[1], Yoshiyuki Yoshida[2]

Department of Physics, Tokyo University of Science Japan[1]
National Institute of Advanced Industrial Science and Technology Japan[2]

Significant progresses toward high performance iron-based superconducting wires/tapes have been made over recent years [1]. Especially for $(Ba,K)Fe_2As_2$, the critical current density exceeded 1.5×10^5 A/cm^2 at 4.2 K under 10 T [2]. For the practical use, a superconducting joining technique is of critical importance. Recently, Zhu *et al.* reported that the superconducting joints fabricated via a hot press (HP) technique show a critical current ratio (CCR) of 63 % at 4.2 K under 10 T. [3] Although the achieved high CCR demonstrates the high potentiality of iron-based superconductors, the CCR value has not been obtained without the HP process unfavorable for industry. Thus, it is necessary to achieve high CCR using a simple process.

In this study, we fabricated superconducting joints between $(Ba,K)Fe_2As_2$- tapes by using a simple cold uniaxial press technique and evaluated their performance. Figure.1(a) shows critical currents (I_c) and CCR of the joint at 4.2 K under magnetic fields parallel to the tape surface. CCR values of 63 % in the self-field and 29 % in 3.5 T at 4.2 K were achieved. Figure. 1(b) shows a SEM image of the cross section of the joint. Micro-cracks were not observed around the jointed part, which is well connected. On the other hand, as shown in Figure. 1 (c), inhomogeneous deformation and macro-cracks were observed at the joint end part. These results suggest that joint end parts prevent CCR from increasing to more than 63%.

[1] Yao. C *et al.*, Supercond. Sci. Technol. **32**, 023002 (2019).
[2] Huang. H *et al.*, Supercond. Sci. Technol., **31**, 015017 (2018).
[3] Zhu. Y *et al.*, Supercond. Sci. Technol., **32**, 024002 (2019)

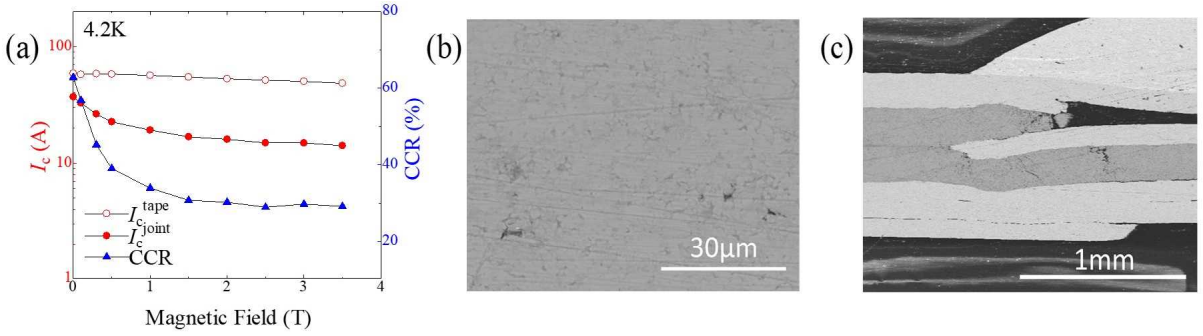

Figure. 1: (a) Magnetic field dependence of I_c and CCR of $(Ba,K)Fe_2As_2$ tape and joint at 4.2 K under field parallel to the tape surface. SEM images of (b) the cross section and (c) the end part of $(Ba,K)Fe_2As_2$ joints.

Keywords: Iron-based superconductors, Superconducting joint, Critical Current Ratio, Critical current