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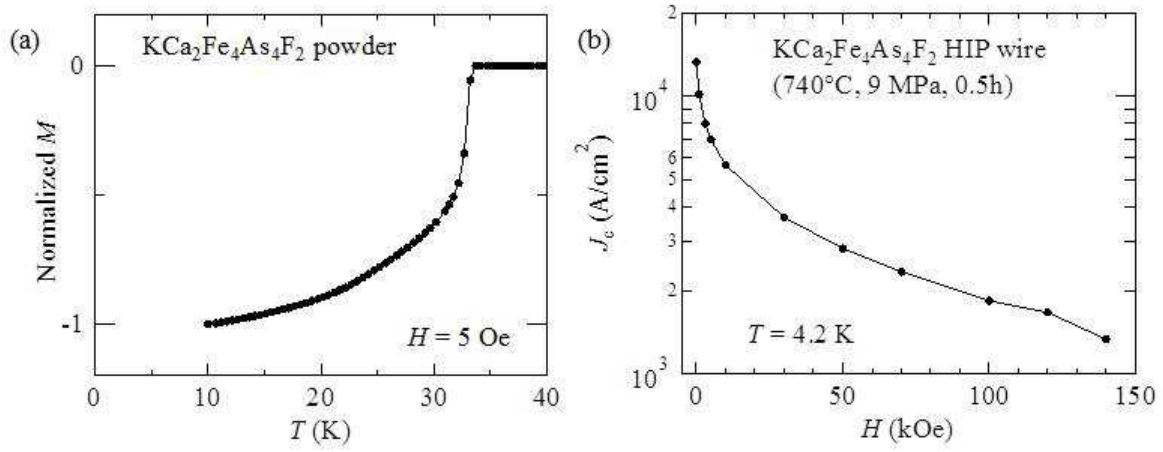
Fabrication and Characterizations of $KCa_2Fe_4As_4F_2$ Superconducting HIP Wires

*Sunseng Pyon[1], Daisuke Miyawaki[1], Tsuyoshi Tamegai[1], Hideki Kajitani[2], Norikiyo Koizumi[2], Satoshi Awaji[3], Hijiri Kito[4], Shigeyuki Yoshida[4], Yoshiyuki Yoshida[4]

Dept. of Appl. Phys., Univ. of Tokyo[1]
Naka Fusion Institute, National Institutes for Quantum and Radiological Science and Technology[2]
High Field Laboratory for Superconducting Materials, Institute for Materials Research, Tohoku University[3]
National Institute of Advanced Industrial Science and Technology[4]

Iron-based superconductors (IBSs) are one of the promising candidates of future high-magnetic-field applications because of their high critical temperature, T_c, high critical current density, J_c, and high upper critical field, H_{c2}. Most of researches on IBS wires and tapes have been conducted using 122-type compounds ((Ba,K)Fe_2As_2 or (Sr,K)Fe_2As_2), and a practical level of J_c above 100 $kAcm^{-2}$ has been achieved in these wires and tapes. On the other hand, other IBS compounds are still investigated as raw materials for superconducting wires and tapes, such as $SmFeAsO_{1-y}$ and $CaKFe_4As_4$, whose J_c at 4.2 K in self-field are approximately 40 and 90 $kAcm^{-2}$, respectively. Here, we report the fabrication and characterizations of $KCa_2Fe_4As_4F_2$ round wires for the first time. Polycrystalline $KCa_2Fe_4As_4F_2$ powder was prepared by solid-state reaction and its T_c was evaluated from magnetization measurement as shown in figure (a). Superconducting wires were fabricated by powder-in-tube (PIT) method and hot-isostatic-press (HIP) technique. The self-field J_c of the $KCa_2Fe_4As_4F_2$ HIP wire fabricated at 740°C under a high pressure of 9 MPa for 0.5h, exceeded 10 $kAcm^{-2}$ as shown in figure (b). Details of the optimization of the round wire to achieve large J_c values and extensive characterizations of wires using X-ray diffraction and magneto-optical imaging will be presented.



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