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Fabrication of (Ba,Na)Fe₂As₂ round wires and tapes using HIP process

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Iron-based superconductors have high critical current density under high magnetic fields, and are expected to be applied as wires under high magnetic fields. Among them, researches on the wires of K-doped 122-based iron-based superconductors have been extensively advanced. In recent years, researches on wires and tapes of Na-doped (Sr,Na)Fe₂As₂ and (Ba,Na)Fe₂As₂ have been undertaken [1], and we have reported a record-high value of critical current density (J_c) of 40 kA/cm² at 100 kOe in (Ba,Na)Fe₂As₂ round wire [2].

In the present study, we fabricated round wires and tapes of (Ba,Na)Fe₂As₂ using HIP (hot isostatic press) process, and evaluated their transport J_c . Polycrystalline powders were synthesized by using pre-synthesized precursors (BaAs, NaAs, Fe₂As), which is simpler than the method of mixing raw materials in a planetary ball mill. Compared with the transport J_c (95 kA/cm² under self field, 40 kA/cm² at 100 kOe) of the wire in the previous study [2], the transport J_c of the present HIP round wire is higher at self-field (129 kA/cm²), but slightly lower at 100 kOe (37 kA/cm²) as shown in the figure. In addition to the results of the round wire mentioned above, we plan to discuss detailed characterizations of the

tape fabricated from the same powder. In particular, X-ray diffraction is extensively applied to the evaluation of the degree of texturing of the wire and tape.

[1] Suwa *et al.*, Appl. Phys.

Express **11**, 063101 (2018).

[2] Miyawaki *et al.*, 74th Annual Meeting of the Physical Society of Japan 16pS305-8 (2019).

Figure. Magnetic field dependence of transport J_c of Ba_{0.6}Na_{0.4}Fe₂As₂ HIP round wires in this study and previous study [2].

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