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M3Or3B-07: Recent progress of 122-type iron-based superconducting wires and tapes

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Iron pnictide superconductors are very attractive for applications in the high magnetic field region, because of their large upper critical field, small anisotropy, etc. In the past few years, substantial efforts have been made to improve the transport performances of 122-type iron-based superconducting wires and tapes by ex-situ PIT technique. Recently, we have made further improvement in the high-field J_c of 122 type pnictide wires, which exhibited a transport J_c as high as 5.5×10⁴ A/cm² at 27 T, 4.2 K. The improved degree of texture and connectivity of grains are accounted for this large in-field J_c. At the same time, to reduce the fabrication cost and improve the mechanical strengths of superconducting wires and tapes, the sheath of the wires was optimized using Cu, Monel, and stainless steel in combination with Ag. For round wires, the highest J_c value reached 3.8×10⁴ A/cm² in Cu/Ag composite sheathed wires at 4.2 K and 10 T, obtained by the hot-isostatic-press technology. The 7-, 37-filament 122 wires and tapes were successfully fabricated by the PIT method, and these multifilamentary tapes exhibited weak field dependence of J_c. Based on the experience of high-performance short samples and multifilamentary wires process, high performance 100-m-long multifilamentary superconducting tape has been produced using the scalable rolling process, confirming the great potential for large-scale manufacture.

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