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M1Po2B-05: A bi-layer barrier design for iron-based superconducting wires

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Iron-based superconducting wires and tapes, particularly 122-type, based on the powder-in-tube method are promising for high-field magnet applications. A promising design is to use silver/copper composite as the sheath material (i.e., Ag is in direct contact with the IBS powder for minimum reaction while Cu is used as the outer matrix to reduce conductor cost and increase the mechanical strength). However, for this design a low heat treatment temperature must be used to reduce Cu/Ag interdiffusion or even formation of liquid, but such a temperature may be well below the optimum heat treatment temperature for the best J_c performance. To solve this issue, a bi-layer barrier design was developed, in which an Nb or Ta layer is inserted between Ag and Cu to prevent their inter-diffusion. In this work we fabricated 122 PIT wires with the regular Ag/Cu sheath and with the bi-layer barrier design, and compared them under various heat treatment conditions.

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