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M1Or2A-04: Effect of Grain Size, Flux Pinning, and High Critical Field in Ternary APC Nb₃Sn Wires

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Nb₃Sn conductors have been made which incorporate ZrO₂ artificial pinning centers (APCs) that serve to refine the grain size of the superconducting material. Work on these wires has resulted in conductors which approach the FCC specification of J_{c} of 1500 A/mm² at 16 T and 4.2 K. Understanding the causes of high J_{c} at mid to high magnetic fields in these wires is crucial for developing an optimum conductor for next-generation particle accelerators. Reduced grain size has been demonstrated to increase J_{c} , due to the increased flux pinning at grain boundaries. In addition, ZrO₂ particles serve as point-like flux pinning centers, with a different behavior versus magnetic field. The relative contribution of these two factors on the J_{c} is evaluated. The effect of stoichiometry on the increased B_{irr} and B_{c2} in ternary APC wires is also considered.

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