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Study on tin and titanium diffusion characteristics for Nb₃Sn strand for FCC conductor

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Nb₃Sn wire is the proposed type II superconductor to be used as the superconducting dipole magnet in Future Circular Collider (FCC) for its superior superconducting properties at high magnetic field (16T). Heat treatment and phase formation of Nb₃Sn internal tin superconductors are quite complicated due to the need to convert low melting temperature tin-rich phases to high temperature copper-rich Cu-Sn phases. The Sn and Ti diffusion is influenced by many factors that the ratio of Cu, Nb and Sn in the non-Cu area on the initial cross-sectional design, and the total strain of Nb during the manufacturing process and the size, quantity, and microstructure of the Nb filaments in the final diameter of the wire. In this study, we investigate that the effect of these design parameters and heat treatment conditions on the Sn and Ti diffusion of Nb₃Sn strand, and the structure and morphology of Nb₃Sn superconducting wire with high J_c performance have been studied by SEM and EDS.

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