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Influence of Zn addition in Cu matrix on the mechanical and superconducting properties of Nb_3Sn conductor

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New generation accelerators, such as future circular collider (FCC), require superconducting dipole magnets with non-copper J_c of 1500 A/mm^2 at 16 T, 4.2 K. Nb_3Sn is the only proven superconductor with large-scale industrial production. Still, present Nb_3Sn wires can not meet the required conditions, and improvement in the fabrication is needed. Kobe Steel Ltd. has developed Nb_3Sn wire by brass matrix distributed-tin (DT) method to achieve high J_c and high mechanical strength.
The elemental addition approach to the Cu matrix was opted to enhance the Nb_3Sn formation and contribute to improving the mechanical properties of the matrix. A heat-treated helical sample soldered on the Walters spring (WASP) to measure the strain dependence of critical current with relatively long length and lower electric field criterion. Axial strain is applied to the wire by applying torque on the WASP at 16 T, 4.2 K.
In this paper, the I_c –strain characteristics of Nb_3Sn conductor, with and without Zn addition in Cu matrix at 16 T, 4.2 K, and S-S behavior at RT and 77 K is presented, and the impact of the findings on the Nb_3Sn conductor development to achieve the FCC target is discussed.

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