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Development of Distributed Tin method Nb₃Sn wire for FCC

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According to the assumed specification of the Nb₃Sn for the accelerator magnets of the FCC (Future Circular Collider), it is required to achieve both extremely high J_c, which is unprecedented, and high RRR and low effective filament diameter (d_{eff}).

We have developed high performance Nb₃Sn wire via DT (Distributed Tin) method, which is a type of internal Sn method with single barrier. So far, Non-Cu J_c of 1,100 A/mm² at 16 T, 4.2 K has been achieved by reducing Sn diffusion length and optimizing Ti content. Effective filament diameter of the samples were about 30 to 60 μm. The values of RRR were about 350, and RRR after 10% rolling assuming deformation of the cabling were 150 to 200, and no decrease in J_c was observed.

From these results, we believe that the DT method has very high potential as a candidate of Nb₃Sn wire for FCC. We will continue to improve J_c by further increasing Nb ratio and optimizing for the Sn diffusion distance, ternary additive elements and heat treatment, etc., for targeting the FCC's specification.

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