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Wed-Af-Po3.21-02 [68]: Refining the grain size and improving critical current in tube type Nb₃Sn conductor in Hyper Tech

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The internal oxidation technique could generate oxide nano particles in Nb₃Sn strands, which could significantly refine the Nb₃Sn grain size and boost the high-field critical current density. Our recent Ta doped ternary APC Nb₃Sn wires with ZrO₂ pinning center demonstrated substantial grain refinement and significantly increased J_{c,nonCu}, while retaining the high B_{c2} values of the best ternary Nb₃Sn conductors. The non-Cu J_cs of these APC conductors has reached nearly 1500 A/mm² at 16 T/4.2 K, which approaches the current CERN FCC spec. Their layer J_c reaches 4700 A/mm² at 16 T/4.2 K - more than double the present best ternary Nb₃Sn conductors. Even so, further improvements are possible using straightforward methods, and by using these we are pushing the fine grain fractions in these conductors up a further 10% to 20% which is expected to lead directly to proportionate increases their J_c. This strand has been made to 61-filament restack strands getting filament size of 45 micros at the 0.5 mm strand. In this paper, we will report the recent progress in this APC Nb₃Sn wire.

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