Contribution ID: **211** Type: **Poster**

Fri-Af-Po.08-09: Study on the Improving the uniformity of Ti distribution in new type of High Jc Nb3Sn Wire Produced by WST

Friday 4 July 2025 14:00 (2 hours)

Nb3Sn wires are wildly used in high-field (> 10 T) magnets and have great potential value in the next several decades. Internal-tin Nb3Sn strand has been developed by many methods for the future fusion reactor, high energy accelerator and so on. Increasing the critical current density of Nb3Sn wire, reducing the use amount of wire in magnets and reducing the price are important ways to promote the industrialization and mass application of Nb3Sn wire. A new type of high Jc Nb3Sn wire without Nb barrier in the 61 sub-elements but with one entire Ta barrier inside the outer copper, was designed and fabricated based on the ITER Internal-tin Nb3Sn with 19 sub-elements. It can be clearly stated that doping a certain amount of Ti has a significant effect on improving the critical current density of the wire. The common three-stage heat treatment process cannot achieve homogeneous distribution of Ti in Nb3Sn phase. Adding a heat treatment platform between the medium temperature stage and high temperature stage of the three-stage heat treatment process can significantly improve the uniformity of Ti distribution in the Nb3Sn phase of the wire after final heat treatment. The Ti content is critical to improve the current density of the wire. After heat treatment, the critical current density of the wire has been significantly improved, reaching 2800A/mm2.

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Session Classification: Fri-Af-Po.08 - Advances in Nb3Sn and MgB2 Conductors I