



Contribution ID: 304

Type: **Invited Oral Presentation**

[Invited] Improvement of J_c of Nb₃Sn conductors by introducing additional pinning centers

Wednesday 12 July 2017 12:30 (30 minutes)

Nb₃Sn superconducting wires have been developed for nearly half a century and their record J_c s have plateaued since the early 2000s. The only opportunity for further significantly improving J_c of Nb₃Sn conductors relative to the present state of the art lies in improving flux pinning capacity. In this talk efforts to improve pinning of Nb₃Sn conductors by introducing additional pinning centers (APC) are reviewed, and it is seen that due to the critical processing requirements of Nb₃Sn wires, the most promising approach is an internal oxidation technique that forms inter-granular and intra-granular ZrO₂ nano particles in Nb₃Sn wires, which can significantly refine Nb₃Sn grain size. This not only causes enhancement of maximum pinning force $F_{p,max}$, but also causes the peak of F_p - B curves to shift to higher fields as grain size is refined to a certain level. Methods to implement this technique in practical Nb₃Sn wires are introduced, and its significant benefit on J_c of Nb₃Sn conductors is shown.

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Session Classification: M3OrC - Focused Session: Latest Development in Flux Pinning III: Pinning, Critical Currents & Creep in HTS