

Mechanical Treatments at Room Temperature of Nb₃Sn Practical Wires: Pre-torsion for Wires with a Different Architecture

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Abstract - Room temperature mechanical treatment consisting of multiple torsion loadings (named pre-torsion) was applied to short samples of Nb₃Sn composite wires with different architecture to reduce thermal residual compressive strain experienced by the superconducting Nb₃Sn filaments. Due to this effect all investigated wires have shown enhancement of the critical current density, I_c up to 56% at 15T and 4.2K. Enhancement of I_c was larger for the reinforced wires than for the wires without reinforcement suggesting that reinforcement is useful in strain relaxation during pre-torsion. The best results were obtained when the position of the reinforcement was located in the outer region of the wire. Pre-torsion is similar or more efficient than cycles of bending loadings (named pre-bending). For pre-torsion, important parameter is the rotation angle per length of the wire and optimum conditions for short wires are valid for long wires. Nonuniformity of I_c along the length of a 0.99 m wire after pre-torsion was minimal, within uncertainty of I_c measurement.

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