

Stress-induced Martensitic Transformation During Tensile Test of Full-size TF Conductor Jacket Tube at 4.2 K

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Abstract - The toroidal-field (TF) conductor jacket of (ITER) is made of modified 316LN stainless steel, s at 650 °C for 200 h to produce Nb3Sn superconducting materials in the final stage. Due to the high electromagnetic forces arising during magnet operation, higher mechanical properties of the jacket materials at cryogenic temperatures are required. In our work, mechanical properties of the full-size TF conductor jacket tube were investigated, which satisfied the ITER IO requirements. Stress-induced martensitic transformation mechanism during tensile test of the conductor jacket material at 4.2 K was characterized by means of in-situ temperature dependent XRD, vibrating sample magnetometer (VSM), and this in conjunction with transmission electron microscopy (TEM). The tensile behavior related to the amount of stress-induced phase transformation at cryogenic temperature was also discussed.

Keywords - ITER, TF conductor jacket, Modified 316 LN, Cryogenic, Martensitic transformation

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