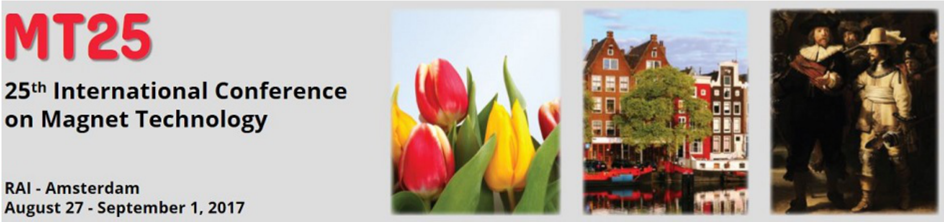

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Changes of superconducting properties due to the unidirectional tensile deformation on bronze-processed Nb3Sn multifilamentary wires using various Cu-Sn-Zn ternary alloy matrices

Monday 28 August 2017 13:15 (1h 45m)

The degradation of transport current property by the mechanical strain on the practical Nb3Sn wire is serious problem to apply for the future fusion magnet operated under higher electromagnetic force. Recently, we developed various Zn solid solution ternary Cu-Sn alloy (Cu-Sn-Zn) matrices for the internal matrix strengthened Nb3Sn wires. Zn remained homogeneously into the matrices after the Nb3Sn layer synthesis, and then Zn substitution in the matrices promoted the synthesis of Nb3Sn layers. We thought that remained Zn might act as the solid solution strength factor of the matrix after the Nb3Sn synthesis. We fabricated easily the Nb3Sn multifilamentary wires using various Cu-Sn-Zn matrices through the conventional bronze process, and also carried out the tensile test under 4.2 K and magnetic field of 15 T on the Nb3Sn multifilamentary wires using various Cu-Sn-Zn matrices. In the stress-strain curves of Nb3Sn multifilamentary wires after heat treatment, Young's modulus was increased with increasing nominal Zn content of Cu-Sn-Zn matrix. In addition, fracture stress of Nb3Sn wire using Cu-Sn-Zn matrix was relatively higher compared with the conventional bronze processed Nb3Sn wire. In the case of the sample using Cu-10Sn-10Zn-0.3Ti matrix, the peak tensile stress in the maximum critical current density was remarkably increased, and it obtained to be about 200 MPa. This tensile stress was similar to CuNb reinforced Nb3Sn wires. In this study, changes of the mechanical properties with different Cu-Sn-Zn matrices were reported. Especially, transport Ic and Hc2 behavior by the tensile deformation on the Nb3Sn multifilamtary wire using various Cu-Sn-Zn matrices was also investigated.
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