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Tue-Mo-Po2.09-02 [64]: Mechanical properties of BaHfO3-doped EuBCO coated conductors fabricated by hot-wall PLD on IBAD template

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REBCO coated conductors (CCs) are promising for high field magnets because of their high in-field critical current density (Jc) performance and high tensile tolerance. To further enhance the in-field Jc, doping artificial pinning centers (APCs) such as BaMO3(M : Zr or Hf etc.) into REBCO film is well known technique. We have developed BaHfO3 (BHO) doped EuBCO CCs using a hot-wall type pulsed-laser-deposition (PLD) with productive high growth condition on ion-beam-assisted-deposition (IBAD) template. We have investigated and discussed the in-field Jc of BHO-doped EuBCO CCs and confirmed that the in-field Jc is certainly improved by introducing the APCs. However, mechanical strength is also one of the most important properties for high field magnet applications because superconducting wires are subjected to various intense stresses in a high-field magnet. Furthermore, strain dependence of Jc in reversible region is also an interesting phenomenon, which is important for magnet design.
In this study, we investigated the degradation characteristics of BHO-doped EuBCO CC tapes with 50 μm-thick and 4 mm-wide Hastelloy substrate and 20 μm-thick copper plating under various stresses such as tension and compression. In the tensile test in the tape longitudinal direction, irreversible degradation of critical current (Ic) was not confirmed up to about 600 MPa, and even with a repetitive tensile test of 1,000,000 times at 500 MPa. Also Ic degradation was not confirmed under the compressive stress up to 100 MPa in the tape width direction, and up to 400 MPa in the tape surface vertical direction. In addition, the strain dependence of Ic in the reversible region and the mechanical properties under low temperatures and magnetic fields are also reported in detail.

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