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# BMO Doped REBCO Coated Conductors with Uniform in-Field Performance and High Growth Rate by Hot-wall PLD Process

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Recent years we have participated in a 3 year program led by NEDO, MITI, to improve in-field transport performance and longitudinal uniformity of REBCO wires designed for 3-T class compact whole-body MRI magnet, without spoiling wire productivity. In this program, we concentrated on optimization of growth conditions for BMO-doped REBCO wires and found a high-growth rate deposition conditions of several 10s nm/sec, by using hot-wall type PLD process, which realized homogeneous crystalline growth conditions for REBCO by furnace-like substrate heating. In-field $J_c$ properties of ~2-times bigger than non-doped ones were eventually obtained in low temperature range below 40 K. Those samples had a scattered short length BMO nano-rod structure, and a random pinning like scaling behavior was observed for the pinning forces in wide temperature range.

In-field $J_c$ uniformity were characterized by Hall-probe magnetization measurement at 77K below 2.0T. Slight field dependent $J_c$ enhancement and/or deviation were observed in several % length of measured samples, but quite good agreement observed for longitudinal $J_c$ variations normalized by maximum $J_c$ point up to 2.0 T. Furthermore, transport tests of 4-layered pancake coils have conducted by using a 34 meters long BMO-doped REBCO wire. The I-V characteristics of the coils agreed very well with numerical engineering estimations of angular dependent in-field $J_c$ for BMO-doped REBCO wires.

Commercial shipment of the BMO-doped wire has started with production samples of 300-600m long and test samples of 1km long class also produced with good $I_c$ uniformity comparable to non-doped REBCO wires. Mechanical reliability of those BMO-doped REBCO wires were also surveyed and the improvement od delamination strength were observed by total process refinement compared to past non-doped production wires. A part of this work is based on results obtained from a project subsidized by the New Energy and Industrial Technology Development Organization (NEDO).

Keywords: REBCO, Coated Conductors, Hot-Wall PLD