

Development of REBCO coated conductors and applications at Fujikura Ltd.

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Abstract

REBa₂Cu₃O_x (REBCO) coated conductors (CCs) are now being mass-produced as practical conductors and are being adopted in a variety of applications, including compact fusion energy reactors. The most attractive features of REBCO CCs are its high in-field critical current (I_c) and mechanical strength, but variability in characteristics and reliability are thought to be major issues. Fujikura Ltd. has realized high-performance REBCO CCs using originally developed Ion Beam Assisted Deposition (IBAD) and Pulsed Laser Deposition (PLD) processes.¹⁾ In addition, our high-rate deposition techniques with artificial pinning centers using hot-wall PLD system achieve both stable in-field high I_c and high productivity²⁾. Advantages of our REBCO products are their long length and uniform I_c characteristics with small lot-to-lot variation. We have developed an original in-house cryogen-free in-field I_c measurement system with a 12 T superconducting magnet and routinely evaluated numerous samples, confirming the reproducibility of I_c characteristics. In terms of mechanical strength, we have conducted various evaluation tests for reliability, including tensile tests, bending tests, delamination tests, and fatigue tests^{3,4)}. Furthermore, we have been utilizing laser slitting technology to fabricate 2-4 mm-width CCs for over 10 years. This technology ensures that our CCs have a crack-free REBCO layer and maintain excellent mechanical properties. We have also been developing applications, including REBCO coils⁵⁾, magnets⁶⁾, and assembled conductors⁷⁾. Some of these experiences have been fed back into the CC manufacturing process. This presentation introduces the recent development topics in REBCO CCs and applications at Fujikura Ltd., including various evaluation test data.

References

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