

Estimation of Critical Current Density of a Superconducting Wire from a Measurement of Magnetization Loss

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For large scale power applications of HTS conductor, it is getting more important to have a stacked HTS coated conductor with low loss for large current capacity. We had proposed a continuous transposed coated conductor (CTCC) with YBCO conductors for large scale HTS power applications, but it was not that easy to measure important electric properties of the CTCC such as an effective critical current. Instead of direct measuring the critical current of the CTCC, indirect estimation from measuring a magnetization loss of CTCC could be useful for practical estimation of the critical current. The magnetization loss of a superconductor is supposed to be affected by a full penetrating magnetic field, and it tends to show an inflection point at the full penetrating magnetic field when we generate the graph of magnetization loss vs. external magnetic field. The full penetrating magnetic field depends on the shape of the conductor and its critical current density, so we can estimate the effective critical current density from measuring the magnetization loss. In this paper, to prove the effectiveness of this indirect estimation of the critical current, we prepared several different kinds of YBCO CC including CTCC short samples and measured the magnetization losses and the critical currents of each sample by using linked pick up coils and direct voltage measurement with transport current respectively. The estimation agreed well with the measured one, which shows this indirect method is practically useful.

keywords : magnetization loss, indirect estimation, critical current

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