

Voltage-current characteristic and transport current AC losses measured by the transformer method in high pressure synthesized MgB₂ bulk cylinders

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The recently developed manufacturing technologies use high pressure and various doping additions to prepare bulk MgB₂-based materials with high critical current density. To measure voltage-current characteristic and AC losses in these samples, a contactless method is applied which is based on the use of the transformer configuration. A MgB₂ hollow cylinder forms the secondary coil of a transformer in which the primary coil is connected with an AC source. Using Hall-probe technique, the magnetic flux density along the cylinder axis was measured as a function of the instantaneous current in the primary coil with following calculation of the electric field and AC losses in the superconductor. The obtained dependence of the losses on the primary current (applied magnetic field) and frequency reveal the sufficient deviations from Bean's model. The character of these deviations is discussed. The obtained results are compared with those revealed from magnetization experiments.