

## **Strong Enhancement of Critical Current Density in MgB<sub>2</sub> Bulk and Ni-Sheathed Tapes With Very Small Dy<sub>2</sub>O<sub>3</sub> Additions**

### **ABSTRACT**

A series of polycrystalline samples were prepared by in situ reaction of Dy<sub>2</sub>O<sub>3</sub> (0.5-5.0 wt.%) with Mg + B. While the superconducting transition temperature, T<sub>c</sub> remained largely unchanged, the intragrain distribution of nano precipitates of DyB<sub>4</sub> and MgO led to strong enhancement in critical current density, J<sub>c</sub> at lower field below 4 T. The best sample (with only 0.5 wt.% Dy<sub>2</sub>O<sub>3</sub> additions) had a J<sub>c</sub> (1 T) of around a factor of 4 higher compared to the pure sample at 6 K and 20 K indicating improved connectivity and pinning. On the other hand, ex situ Ni-sheathed tapes fabricated from the Dy<sub>2</sub>O<sub>3</sub> added powders exhibited critical current, I<sub>c</sub> (4.2 K) superior to those made from pure MgB<sub>2</sub> powders at higher field above 3 T. The former also showed lower anisotropy in I<sub>c</sub> with respect to field direction.

**Keyword:** Critical current density, Dy<sub>2</sub>O<sub>3</sub> additions, pinning.