Transport Critical Current Densities of MgB_2/Fe Wires Fabricated by Combining Ball-Milling and Glycerin Treatment for Boron Powder

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In this study, we have measured the field dependence of the critical current density for MgB_2 wire with ball-milled and glycerin treated boron powder. The carbon substitution for boron site of MgB_2 with a chemical solution method can be advantageous because of highly uniform mixing between the glycerin and boron powders. In addition, refined boron powder by milling process can cause smaller grain size of the MgB_2, which can increase flux pinning. It was observed that transport critical current density, J_c, for the milled and carbon doped MgB_2 wire heat-treated at 600°C for 40 hours was 5,510 Acm^{-2} at 4.2 K and 8 T. For a pure wire, however, J_c was ~1,010Acm^{-2} at a same condition. This indicates that both the carbon substitution and small grain size could strengthen flux pinning. We have also investigated a comparative study between transport and magnetic measurements for critical current.

Keywords : MgB_2, ball-milling, glycerin, transport critical current density

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