Effect of Dry and Wet Mixing Methods of MgB₂ Bulks with Phenol-formaldehyde Resin as a Carbon Source


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We investigated the effect of two different mixing methods in MgB₂ bulks with phenol-formaldehyde (PF) resin as a carbon source on the microstructure, lattice parameters, and critical properties of MgB₂ bulks. One of the mixing methods is a dry mixing and the other is a wet mixing. The precursor powders using dry and wet mixing methods are prepared by the ball mixing with Mg, B, PF resin in Ar atmosphere and conventional solution process in alcohol, respectively. The precursor powders were compacted into the compacts, followed by annealing at 900°C for 1 hr in Ar atmosphere.

The microstructure and phase identification of the MgB₂ bulks were observed by scanning electron microscopy (SEM) and x-ray diffraction (XRD), respectively. The critical temperature (Tₐ) and critical current density (Jₐ) were determined with magnetic property measurement system (MPMS) in applied magnetic field. The MgB₂ bulk made by wet mixing method had a higher Jₐ (8.9 × 10³ A/cm² at 6.6 T and 5 K) than those of pure MgB₂ and MgB₂ made by dry mixing method.

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Keywords: carbon doping, dry mixing, MgB₂ bulk, phenol-formaldehyde resin, wet mixing.