Superconducting Properties of MgB_2 Bulk Formed by MgB_4 + Mg Mixtures

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One of the most common techniques to fabricate MgB_2 superconductor is by an *in situ* method where an elemental Mg + 2B mixture is used and reacted *in situ* during a heat treatment to form MgB_2 phase. Although relatively good superconducting properties can be achieved, the density of the MgB_2 sample after its formation is rather low with a particularly porous microstructure. This is due to a reduction in volume of the MgB_2 formation from its elemental Mg and B phases and the volatility of Mg powder above its melting point of 650°C. Other alternative precursors with the aim of reducing the amount of pure Mg powder in the starting material, such as MgH_2, Mg_2Cu and Mg_4Ag were also used by other groups in an attempt to further improve the MgB_2 properties. In this study, the superconducting properties of MgB_2 bulk formed by MgB_4 + Mg mixtures were investigated. MgB_4 powder was synthesized at 1000°C for 5 hours in flowing Ar gas. The density of the MgB_2 bulk formed in this method is higher than the conventional MgB_2 bulk formed by Mg + 2B. However, lower J_c values were observed especially at low fields due to the high amount of MgO and MgB_4 present, thus decreasing the effective cross sectional area and the connectivity of the samples. Although an enhancement of H_{c2}(T) was observed, the result showed no significant improvement in the H_{irr}(T).

Keywords: MgB_2, MgB_4, precursor powder, critical current density

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