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Wed-Af-Po3.25-10 [113]: Enhancement of high field Jc of MgB2 superconductors by carbon doping through coating process

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The Tc of MgB2 superconductors, 39 K, is higher than low temperature superconductors such as NbTi and Nb3Sn, which can allow operating at 20 K by using refrigeration system without the consumption of expensive L-He. In addition to the high Tc, MgB2 has the advantages of longer coherence lengths and the lower anisotropy effect, when compared with the high temperature superconductors, and the low cost of the starting materials. These features of MgB2 superconductor could be promising for adoption of industrial superconducting applications. However, rapid decrease in critical current density (Jc) as applied magnetic fields due to relatively low upper critical field (Hc2) and weak flux pinning force leads to a restriction of practical applications. To overcome the problem, many researchers have been studied and proved carbon doping by direct addition or chemical doping approach to be effective to improve field dependence of critical current density.

In this study, therefore, we have doped carbon containing organic matter with the different doping level by coating process, which is the ease of scale-up production, and analyzed the presence of organic matter and carbon on the precursor particles. In addition, changes in microstructure of polycrystalline MgB2 induced by disorder of lattice, which is created by partial substitution of carbon atoms into boron site, were confirmed by results of broadening of FWHM of MgB2 in-plane and reduction of a-axis lattice constant. Also, superconducting properties, critical transition temperature and critical current density, were measured both by transport measurement and magnetization measurement using PPMS under different temperature and magnetic fields.

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