Fabrication of MgB_2 Wires Using the Mixed *in-situ* and *ex-situ* Powders

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We fabricated the MgB_2 wires using *in-situ* (Mg + B), *ex-situ* (MgB_2) and mixture of both *in-situ* and *ex-situ* powders and correlated the condition of precursor powders to critical properties. In addition, the carbon black was added to the precursors in order to evaluate the effect of carbon black doping on the critical properties. The mixed powders were prepared to be $(MgB_2)_x(Mg + 2B)_{0.99-x}$ + 1 at% C, where x is 0, 0.3, 0.5, 0.7, and 1. The precursor powders were filled into the Fe tube (O.D: 8 mm and I.D: 5.4 mm) and compacted by drawing to a final diameter of 1.4 mm and the wires were then sintered at 900℃ for 1 hour.

We observed that the Kirkendall voids decreased and the core density increased as the fraction of *ex-situ* powder (x) increased, on the other hand, the size and density of macro-crack increased. For the MgB_2 wires of x = 0-0.5, the J_c behavior under magnetic field was similar, in contrast, for the wires of x > 0.4, the J_c decreased more quickly as the applied magnetic field increased, which is probably due to the formation of micro-crack in the core. The relation between microstructure and J_c of wires will be presented in detail.

Keywords: Carbon black, critical properties, *ex-situ*, *in-situ*, MgB_2