Enhanced J_c (B) Behavior of MgB_2 Superconductor by Cellulose Acetate (CA) Doping

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We fabricated the cellulose acetate (CA)-doped MgB_2 via an in-situ reaction process and investigated the effect of CA doping on the phase formation, microstructure, and critical properties. Mg powder was stoichiomatrically mixed with precursor powders consisting of B and 0~10 wt% CA powders which had been processed by dissolution in an organic solvent, ultrasonic mixing, and vaporization. The mixed powders were pressed into pellets and subjected to heat-treatment at 900°C in Ar atmosphere.

Phase was identified by high resolution x-ray diffraction (XRD) and microstructure was observed by scanning electron microscopy (SEM). DC magnetization was measured by magnetic property measurement system (MPMS) to evaluate the critical temperature (T_c) and critical current density (J_c). CA doping effectively substituted C for B sites in MgB_2, resulting in a significantly enhanced $J_c(B)$ behavior. 5 wt% CA-doped MgB_2 showed a J_c of 7.76 kA/cm^2 being seven times higher than that of the pure MgB_2 at 5 K and 6.6 T (1.04 kA/cm^2).

Acknowledgement
This research was supported by a grant (R-2006-1-248) from Electric Power Industry Technology Evaluation & Planning (ETEP), Republic of Korea

Keywords: Cellulose acetate, In-situ, MgB_2, J_c (B)