Effect of Mechanical Alloying on the Superconducting Properties of *ex-situ* MgB_2 Wire

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We fabricated the *ex-situ* MgB_2 wire using mechanical alloying process and investigated the effect of milling time on the phase formation and the superconducting properties. The commercially available MgB_2 powder was mechanically alloyed using planetary ball milling tool for 0 h, 25 h, 50 h and 100 h. The precursor powder was filled into Fe tube and then drawn into wire with an outer diameter of 1.4 mm. Sintering was processed at 1000℃ for 1 hour under an inert atmosphere. Phase identification and microstructural observation were performed by high resolution x-ray diffraction (XRD) and scanning electron microscopy (SEM), respectively. The critical temperature (T_c) and critical current density (J_c) were determined by magnetic property measurement system (MPMS) under magnetic field.

As the milling time increased, the T_c of the wire decreased, on the other hand, the J_c degradation under applied magnetic field became smaller. The wire prepared by mechanical alloying in magnetic field of above 5 T had a higher value compared to that of the untreated wire. For the 50 h-milled, the highest J_c was measured to be about 3.3×103 A/cm^2 at 5 K and 6 T. This result is considered to be grain refinement by mechanical alloying process.

Keywords : critical current density, *ex-situ*, mechanical alloying, MgB_2