

Influence of Mg Deficiency on the Superconductivity in the MgB₂ Thin Films Grown by HPCVD

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The effects of Mg deficiency in the MgB₂ films grown by hybrid physical-chemical vapor deposition were investigated after vacuum annealing at the various temperatures. High quality MgB₂ films grown on *c*-cut Al₂O₃ substrates with different superconducting transition temperature (T_c) of 40.2 and 41 K were used in this study. As the annealing temperature was increased from 200 to 800 °C, Mg contents in the MgB₂ films were also systemically decreased, but T_c 's did not change within ± 0.11 K, until annealing temperature reached up to 700 °C. For MgB₂ films annealed at 800 °C for 30 min, however, no superconductivity was observed and the temperature dependence of resistivity showed semi conducting behavior. We also found that the residual resistivity ratio was decreased with increasing annealing aperture.