

Fabrication of MgB₂ Thin Films by rf Sputtering

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We have studied fabrication of MgB₂ thin film on SrTiO₃ (001) and r-cut Al₂O₃ substrates by rf magnetron sputtering method using an MgB₂ single target and two targets of Mg and B, respectively. Based on P-T phase diagram of MgB₂ and vapor pressure curves of Mg and B, a three-step process was employed. B layer was deposited at the bottom to enhance the film adhesion to the substrate. Secondly, co-sputtering of Mg and B was done. Finally, Mg was sputtered on top to compensate for the loss of Mg during annealing. Subsequently, MgB₂ films were *in-situ* annealed in various conditions. The sample fabricated using the three-step process showed T_c of 24 K and formation of superconducting MgB₂ phase was confirmed by XRD spectra. In case of co-sputtering deposition, T_c depended on annealing time and argon pressure. However, those made by single-target sputtering showed non-superconducting behavior or low transition temperature, at best.

keywords : MgB₂ thin film, rf sputtering