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Artificial pinning centers created by Fe2O3 coating on MgB2 thin films

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Abstract

MgB2 thin films were fabricated on MgO (1 0 0) single crystal substrates. First, deposition of boron was performed by rf magnetron sputtering on MgO substrates and followed by a post-deposition annealing at 850°C in magnesium vapor. In order to investigate the effect of Fe2O3 nanoparticles on the structural and magnetic properties of films, MgB2 films were coated with different concentrations of Fe2O3 nanoparticles by spin coating process. The magnetic field dependence of the critical current density Jc was calculated from the M–H loops and also magnetic field dependence of the pinning force density $f_p(b)$ was investigated for the films containing different concentrations of Fe_2O_3 nanoparticles. The critical current density J_c was found to be around 1.8×10^6A/cm² and 1.3×10^6A/cm² for the films with the concentration of 50% and 33% Fe_2O_3, respectively. It was found that the films coated with Fe_2O_3 nanoparticles have slightly enhanced critical current density.