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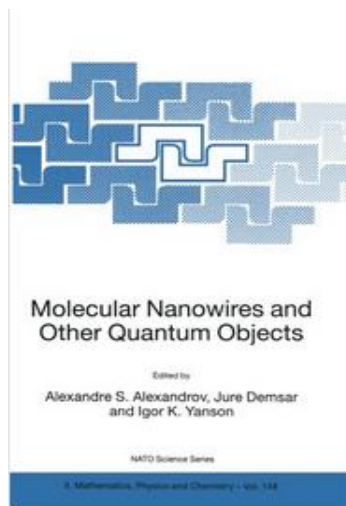
Preparation of rare-earth manganite-oxide thin films by metalorganic aerosol deposition technique

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Abstract

MgB₂ thin films were fabricated on *r*-plane Al₂O₃ (1102) substrates. First, deposition of boron was performed by rf magnetron sputtering on Al₂O₃ substrates and followed by a post-deposition annealing at 850 °C in magnesium vapour. 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 J_c was calculated from the M–H loops and magnetic field dependence of the pinning force density, $f_p(b)$, was investigated for the films containing different concentrations of Fe₂O₃ nanoparticles. The critical current densities, J_c , in 3T magnetic field at 5 K were found to be around 2.7×10^4 A/cm², 4.3×10^4 A/cm², 1.3×10^5 A/cm² and 5.2×10^4 A/cm² for films with concentrations of 0, 25, 50 and 100% Fe₂O₃, respectively. It was found that the films coated with Fe₂O₃ nanoparticles have significantly enhanced the critical current density. It can be noted that especially the films coated by Fe₂O₃ became stronger in the magnetic



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field and at higher temperatures. It was believed that coated films indicated the presence of artificial pinning centres created by Fe_2O_3 nanoparticles. The results of AFM indicate that surface roughness of the films significantly decreased with increase in concentration of coating material.