Preparation and Studies of Thin Films of Cu-doped $GdSr_2RuCu_2O_8$

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Abstract

Preparation of superconducting thin films of the Cu-doped Ruthenocuprate superconductor $GdSr_2Ru_{0.9}Cu_{2.1}O_8$ has been attempted by pulsed laser deposition method. Thin films were deposited on different substrates employing different laser ablation parameters with the idea of obtaining good-quality films which exhibit superconductivity. The crystal structure and morphology of the thin films were characterized by X-ray diffraction and scanning electron microscopy measurements and optical characteristics by Raman scattering measurements. High-temperature ex situ oxygen annealing led to the formation of homogeneous films with the occurrence of an onset of superconductivity, traced by electrical resistivity measurements. Increasing the annealing time has led to a systematic improvement in the sample quality and the physical properties. However, prolonged high-temperature annealing seems to cause deterioration in properties as seen from electrical resistivity and Raman scattering measurements. The studies reveal the importance of an optimal high-temperature oxygen annealing procedure to induce superconductivity in thin films of this Ruthenocuprate system.