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Structure and properties of oxygen-containing thin MgB2 films

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The results of the investigations of crystal structure, phase composition, relief, and superconducting characteristics of the oxygen-containing thin films from magnesium diboride (MgB2), which are deposited on the dielectric wafers by a magnetron sputtering of the magnesium diboride targets, are presented. It has been demonstrated that depending on the parameters of the deposition and annealing processes the thin films with various degrees of the structure perfection and phase composition could be fabricated. The various combinations of the Abrikosov vortices pinning types could be realized in the films such as a pinning in the places of fluctuation of superconducting critical temperature (δTc -type) or a pinning in the places of fluctuation of the free path length (δl-type). The appearance and density of these fluctuations can be influenced by the synthesis conditions. We obtained the deposited superconducting thin films, the structure of which can be described as MgBxOy and is in fact a solid solution of oxygen in the magnesium diboride crystal lattice. The density of superconducting critical currents of these films attains 1.8•1011 –8.2 • 1010A/м2 at 10 K and 8•1010 –2.8 • 1010A/м2 at 20 K in the 0–1 T fields (if an external magnetic field is oriented in parallel to the wafer surface) .

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