

Microstructure of MgB₂ Thin Film Deposited on r-plane Sapphire Substrate by Co-Evaporation Method

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The microstructural features of MgB₂ thin film deposited by co-evaporation method have been investigated by transmission electron microscopy (TEM). MgB₂ films were deposited on r-plane sapphire substrate. The critical temperature of this film was measured to be 38K. Cross-sectional TEM images showed that the MgB₂ deposited on r-plane sapphire substrate contain columnar structures. According to the results of selected-area electron diffraction patterns, the films deposited on the r-plane sapphire substrate had c-axis orientation. And EDS data reveal that MgO is the major second-phase in our film. Since the various structural features such as interface between the layers, defects, and the texture orientation across the MgB₂ thin film affect the superconducting properties, cross-sectional analysis with TEM plays a critical role in understanding the relationship between the microstructure and the superconducting properties. The structural features such as 2nd phases, crystal orientation across the interface, and defects in the cross-sectional direction were characterized with TEM, STEM-EDS, and HRTEM.

Keywords: MgB₂, TEM, co-evaporation

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