

Ⅱ~10] [젊은 진공과학자상 후보]

Preparation of High Quality RuO₂ Electrodes for High Dielectric Thin Films by Low Pressure Metal Organic Chemical Vapor Deposition

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Highly conductive RuO₂ thin film recently attracts considerable interest because it is one of candidate electrode materials for high dielectric constant (Ba,Sr)TiO₃ thin film, which is also the most possible candidate material for a capacitor of ULSI DRAM. For higher than 1 giga bit DRAM a capacitor must have a 3-dimensional structure, even though the BST thin films are used as a dielectric material, because of its extremely small size. Therefore, conformal deposition techniques such as MOCVD for the deposition of electrode materials as well as the BST thin film are essentially required. In this study, high quality RuO₂ thin films with a good electrical conductivity were deposited at 250 - 450°C by MOCVD using Ru(C₁₁H₁₉O₂)₃[Ru-TMHD], which is first adapted for the deposition of RuO₂ thin films. Deposition behavior and properties of RuO₂ thin film were affected by both the substrate temperature and the added amount of oxygen during deposition. Oxygen addition should be essential to deposit RuO₂ thin films because no films were deposited without oxygen. The deposited RuO₂ thin films with smooth crack free surfaces showed very low resistivities of 45 - 50 μΩcm. At lower deposition temperature and smaller amount of oxygen addition, RuO₂ thin films showed smoother surface morphologies and better step coverage. The BST capacitors of using MOCVD RuO₂ thin films show good electrical properties, indicating that the MOCVD process for RuO₂ thin films can be applied for the deposition of electrode for high dielectric constant thin films used as dielectric materials for ULSI DRAM.