Abstract

The advancement of dynamic random access memories (DRAM' s) has significantly decreased the available area per cell. Electroceramic thin films with high dielectric constant have attracted great attention for practical use in capacitors of gigabit DRAM' s since the adoption of high-dielectric-constant materials can lower the height of the storage node and simplify the cell structure. One of the most promising materials for the capacitor dielectric films is $(Ba,Sr)TiO_3$ (BST) because of its high dielectric constant, low leakage current density, high dielectric breakdown strength, paraelectric perovskite phase that does not exhibit fatigue, and the ease of composition control due to the absence of volatile lead oxide.

The literature indicate the bottom electrode effects greatly the electric properties of BST. After annealing at 600~700℃ the BST with the bottom electrode of Ir possesses higher dielectric constant due to the IrO_2 formation at the BST/Ir interface. To enhance the dielectric constant of BST without annealing process, the BST film were sputtered on the electrode of Ir under high working pressure of mixing Ar/O_2 gas in this research. In the condition, the thin film of IrO_2 was formed simultaneously at the interface between the BST and Ir films during the BST-deposited process. The best dielectric constant can achieve 926 at 550℃, but the leakage current is very poor. Finally, we apply the double BST layers, which was sputtering with pure Ar and mixing Ar/O_2 gas, can not only have large dielectric constant but also have low leakage current.