

Electrical properties of metal-ferroelectric-insulator-semiconductor structure using $\text{Ba}_x\text{Sr}_{1-x}\text{TiO}_3$ for ferroelectric-gate field effect transistor

Abstract

Perovskite ferroelectric $\text{Ba}_x\text{Sr}_{1-x}\text{TiO}_3$ ($x = 0.5, 0.6, 0.7$ and 0.8) thin films have been fabricated as metal-ferroelectric-insulator-semiconductor (MFIS) configurations using a sol-gel technique. The C-V characteristics for different Ba-Sr ratios and different film thicknesses have been measured in order to investigate the ferroelectric memory window effect. The results show that the memory window width increases with the increase both of Ba content and film thickness. This behavior is attributed to the grain size and dipole dynamics effect. It is found also that the memory window increases as the applied voltage increases. In addition, the leakage current density for the films is measured and it is found to be of the order of 10^{-8} A/cm² for all tested samples, indicating that the films have good insulating characteristics.