Journal Article Volume 29, Issue 2 Medziagotyra Pages 159 – 166

Impact of Annealing Temperature on Electrical Properties of Sol-gel Ba0.90Gd0.10TiO3 Thin Films

Abstract

Ba0.90Gd0.10TiO3 (BGT) thin films have been fabricated in MFM configuration via sol-gel technique at the different annealing temperature. The dielectric parameters of the films are measured using Impedance Analyzer as a function of frequency. It is found that, at frequency 1 kHz, the measured value of ε increases from 57 to 264 as the annealing temperature increases from 600 °C to 900 °C, which is correlated to the improved crystallinity and grain size increment. The ferroelectric hysteresis of the films is analyzed using Sawyer-Tower circuit that shows an enhancement for the ferroelectric properties with annealing temperature, which is also confirmed using C-V characteristics. The leakage current of the films is evaluated via Semiconductor Parameter Analyzer (SPA), which shows that at a certain electric field, the leakage current density increases as the annealing temperature increases, that is attributed to the crystallinity and grain size improvement. The conduction mechanism of the films is deeply investigated through different models to find out that the space charge limited conduction (SCLC) mechanism is the controlling conduction process.

Keywords

Annealing Temperature; Ba0.90Gd0.10TiO3; Conduction Mechanism; Dielectric; Ferroelectric