

Growth Studies of Thin Films of BaTiO₃ Using Flash Evaporation

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Abstract

A flash evaporation technique was implemented to grow polycrystalline thin films of BaTiO₃ onto Si(100) substrates, which were prepared with protective layers of SiO₂ or Pt/TiW. X-ray diffraction and X-ray photoelectron spectroscopy studies of the films suggest the formation of BaTiO₃ with good stoichiometry and with a tetragonal crystal structure phase for a given set of growth parameters. The inspection of the films under scanning electron microscopy revealed that the topography and morphology depended strongly on the type of the protective layers. Grain sizes smaller than 0.1 μm were found for films deposited on the SiO₂ layer and around 1 μm for films on top Pt/TiW layers. Preliminary studies of the dielectric properties of the films grown onto Pt/TiW show that the dielectric loss varied from 0.01 to 0.1 and the dielectric constant varied from 8 to 75 at 1 kHz. The electrical resistivity varied from 10^{12} to 10^{13} $\Omega\text{-cm}$ and the breakdown electric field had values from 180 to 1000 kV/cm for these films.