Solution synthesis and characterization of lanthanum ruthenate as candidate electrode for ferroelectric thin films

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Generally Pt bottom electrodes are used in non-volatile ferroelectric random access memories. However, problems such as fatigue and leakage current, in the case of ferroelectric thin films limit the use of noble metal electrodes. Potential electrode materials which could be used instead of noble metals are conductive oxide compounds such as RuO_2, $SrRuO_3$, IrO_2 and $La_{1-x}Sr_xCoO_3$. RuO_2 and ruthenate-based materials are known to be good electrical conductors.

In this work the solution synthesis of lanthanum ruthenate in the form of powders as well as thin films is discussed. The advantages of chemical solution methods in comparison with conventional solid state synthesis are lower processing temperatures, better homogeneity and better control of stoichiometry.

Thin films are prepared by spin coating the precursor solution on silicon and sapphire substrates. The crystallization behavior of the obtained phases is followed by thermal analysis and X-ray diffraction, and microstructure evaluation by scanning electron microscopy and transmission electron microscopy. The ferroelectric response of PZT thin films with lanthanum ruthenate bottom electrodes is evaluated.