

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Dielectric Behavior of Compositionally Graded Ferroelectrics

MOHAMED EL-NAGGAR, KAUSHIK DAYAL, DAVID GOODWIN, KAUSHIK BHATTACHARYA, California Institute of Technology — Graded ferroelectric thin films offer the possibility of engineering the dielectric response by spatial variations in composition. While a homogenous ferroelectric material achieves very high dielectric constants near the phase transition, heterogeneous compositions can result in high dielectric responses over a wide range of temperatures. This can be understood as an “aggregate” response of the graded film, and has been experimentally observed. It is a promising candidate for tunable microwave applications that benefit from temperature-insensitivity. We examine this issue through a continuum model that accounts for the spatial variation in properties and the long-range electrostatic interaction. This model is applied to graded Barium Strontium Titanate and Lead Barium Titanate films in a single-domain system where the polarization gradient is normal to the film surface. We examine the effect of grading and the geometry of electrode/ferroelectric layers on the dielectric behavior with temperature and provide results that are useful as design tools for functionally graded devices.

Mohamed El-Naggar
California Institute of Technology

Date submitted: 16 Jan 2006

Electronic form version 1.4