

Challenges in Processing of Bulk and Thin Film Ferroelectric Oxides

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This tutorial aims to address basic practices of processing in thin films and bulk embodiments of ferroelectric oxide materials. The properties of a ferroelectric are controlled by their structure over many scales, including the electronic structure of the constituent ions, the point defects that form during processing; as well as induced by aliovalent doping, crystallographic symmetry, domain structure accounting for macroscopic symmetry, and the overall microstructure. Controlled processing is crucial to obtaining the targeted properties. This may also enable non-equilibrium processing conditions which result in structures and properties beyond what can be provided by the equilibrium phases.

The specific issues to be addressed include:

- 1- Cation volatilization
- 2- Doping strategies and compensation mechanisms in relationship to processing conditions
- 3- Phase and microstructure development
- 4- Impact of substrate choice in thin films

The techniques that will be covered include conventional ceramic processing techniques, pulsed laser deposition, chemical solution deposition, and sputtering.