In-Situ Characterization of Piezoelectric Materials via X-Ray Diffraction

Jon Giencke, Brian Jones
Bruker AXS – 5465 East Cheryl Pkwy – Madison, WI – US

Over the past 10 years, one of the most exciting areas of research has been the development of materials exhibiting multiferroic effects. A classic example of this is the piezoelectric effect, where the application of an electric field results in a change in the structure of the material. Structural measurements of these materials are difficult due to microscopic device size and device breakdown due to the application of large electric fields. Typically the physical deformation in these materials is determined by macroscopic techniques such as double beam interferometry, but x-ray diffraction offers a unique opportunity to study fundamental structural changes at the sub-unit cell level.

In this presentation I will discuss the structural characterization of microscopic epitaxial thin film capacitors via x-ray diffraction while applying an electric field. In order to facilitate the measurement, a microfocus x-ray source and large two dimensional area detector are used. Additionally, a new method for the simultaneous refinement of the in plane and out of plane lattice parameters of epitaxial thin films will be discussed.