Measurement and analysis of field-induced crystallographic texture using curved position-sensitive diffraction detectors - DTU Orbit (25/12/2018)

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This paper outlines measurement and analysis methodologies created for determining the structural responses of electroceramics to an electric field. A sample stage is developed to apply electric fields to ceramic materials at elevated temperatures during neutron diffraction experiments. The tested voltages and temperatures range from -20 kV to +20 kV and room temperature to 200 A degrees C, respectively. The use of the sample environment for measuring the response of ferroelectric ceramics to an electrical stimulus is demonstrated on the instrument Wombat, a monochromatic neutron diffractometer employing a curved positive sensitive detector. Methodologies are proposed to account for the geometrical effects when vector fields are applied to textured materials with angularly dispersive detector geometries. Representative results are presented for the ferroelectric (Bi$_{1/2}$Na$_{1/2}$)TiO$_3$-6%BaTiO$_3$ (BNT-6BT) which show both phase transformation and ferroelectric domain texturing under the application of an electric field. This experimental and analysis approach is well suited for time-resolved measurements such as stroboscopic and in situ studies on a variety of electro-active materials.

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