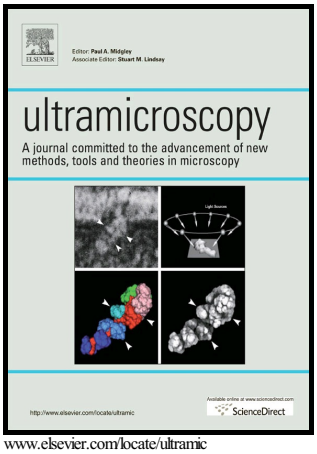
Mapping 180° Polar Domains Using Electron Backscatter Diffraction and Dynamical Scattering Simulations

Matthew J. Burch, Chris M. Fancher, Srikanth Patala, Marc De Graef, Elizabeth C. Dickey



www.elsevier.com/locate/ultramic

PII: S0304-3991(16)30329-1
DOI: http://dx.doi.org/10.1016/j.ultramic.2016.11.013
Reference: ULTRAM12243

To appear in: *Ultramicroscopy*

Received date: 19 July 2016
Revised date: 2 November 2016
Accepted date: 17 November 2016

Cite this article as: Matthew J. Burch, Chris M. Fancher, Srikanth Patala, Mar De Graef and Elizabeth C. Dickey, Mapping 180° Polar Domains Using Electro Backscatter Diffraction and Dynamical Scattering Simulations, *Ultramicroscopy* http://dx.doi.org/10.1016/j.ultramic.2016.11.013

Mapping 180° Polar Domains Using Electron Backscatter Diffraction and Dynamical Scattering Simulations

Matthew J. Burch[1], Chris M. Fancher[1], Srikanth Patala[1], Marc De Graef[2], and Elizabeth C. Dickey[1]

[1]Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, USA

[2]Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburg, PA, USA

Keywords: EBSD; Ferroelectric; Ferroelectric Domain; Electron Backscatter Diffraction;

Abstract

A novel technique, which directly and nondestructively maps polar domains using electron backscatter diffraction (EBSD) is described and demonstrated. Through dynamical diffraction simulations and quantitative comparison to experimental EBSD patterns, the absolute orientation of a non-centrosymmetric crystal can be determined. With this information, the polar domains of a material can be mapped. The technique is demonstrated by mapping the non-ferroelastic, or 180˚, ferroelectric domains in periodically poled $LiNbO_3$ single crystals. Further, the authors demonstrate the possibility of mapping polarity using this technique in other polar materials system.

Introduction