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In-situ Structural Analyses in Electroceramics Using High Resolution Synchrotron X Ray Diffraction

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High Resolution Powder X Ray Diffraction (HR-XRD) is a technique which has been solving important phase diagrams of several high applicable piezoelectric solid solution systems, such as the wellknown case of the monoclinic phase at the PZT and PMN-PT [1, 2]. As an example of an important scientific problem in electroceramics, the structural phase transitions induced by an electric field of such ceramics, still lack a broad understanding. Focused on the phase diagram problem in piezoelectric ceramics (as a function of temperature or other external fields), in this presentation we are going to introduce a number of possibilities of the high-resolution X Ray Diffraction at the new HR-XRD beamline at the new Brazilian Synchrotron Light Source – Sirius, which is going to be optimized to High Resolution X-Ray Diffraction and to in-situ fast experiments such as reaction and phase transitions. As recent results from the actual UVX light source, this work also reports a preliminary investigation of the crystalline structure of (Pb,Ca)TiO3 [3] and PMN-PT [2] as a function of a D.C. electric field carried out at XPD beamline (X-Ray Powder Diffraction) at UVX from Brazilian Synchrotron Light Laboratory (LNLS for its initials in Portuguese). The bulk samples were analysed in two geometries of parallel plate capacitors to study the poling directions which are parallel and perpendicular to the detected X ray scattering vector. The hysteretic behavior of the structural strains agrees with the ferroelectric properties of these materials. Finally, the analyses of the XRD pattern, as a function of the electric field comparing the tiny structural changes in the two poling directions, provide important structural answers about the ferroelectric domain switch. [1] B. Noheda, et al. APL, 74, 1999. [2] B. Noheda, Phase Transitions, 79, 2006. [3] V. V. Erenkim, ISAF, 1994 The authors would like to thank Dr. Ducinei Garcia and Ms. Lais Nogueira from UFSCar for the samples and discussions. The authors are also thankful Dr Guilherme Calligaris, MSc. Diego Felix Dias and Ms. Thissiana Fenandes Cunha for the beamtime work and discussions.