



Contribution ID: 31

Type: Poster Presentations

XRD, USAXS, SAXS and WAXS Investigations of PZN-4.5PT nanoparticles thin Films

Friday, 20 November 2020 17:25 (1 hour)

The $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-4.5PbTiO}_3$ (PZN-4.5PT) single crystals showed very large ferroelectric and piezoelectric properties compared to traditional ferroelectric ceramics (BaTiO_3 and PZT) used presently as active material in medical imaging, detection and sonars. However, despite these excellent properties, the greatest difficulty to use PZN-4.5PT single crystals on electronic devices is to achieve them in thin layers form because of their incongruent melting property. To overcome this difficulty, we deposit them as thin layers by dispersing their nanoparticles in a gel containing a matrix that can maintain at least their bulk properties. After this size reduction at nanoscale and the annealing process following the deposition, changes and structural transformations would occur. We fabricate with success thin films by dispersing these nanoparticles in a gel. The materials show some agglomeration at the surface of the silicon substrate films (from SEM images) and non-identified hexagonal microcrystals, which could be at the origin of their excellent properties.

In this paper we use the combined USAXS/SAXS/WAXS instrument at 9ID beamline at APS-ANL for in situ characterization of undoped and 1% Mn doped PZN-4.5PT inorganic perovskite nanoparticles thin films deposited on nanostructured silicon to understand the phases transitions and determine the observed hexagonal microcrystals structure. It revealed a hexagonal structure of the nanoparticles thin films, which could be explained by the new phase that can be assigned to the $\text{Pb}_3(\text{PO}_4)_2$ based component. The peak at 31° indicates the presence of the rhombohedral phase perovskites assigned to the nanoparticles. XRD spectra, Raman and EDX mapping are compared to the USAXS, SAXS and WAXS results.

Keywords: Perovskite, nanoparticles, thin film, Synchrotron, Xray

Figure 1: EDX mapping for PZN-4.5PT thin film on silicon substrate after annealing.

Primary author: Mr NDIOUKANE, Rémi (Laboratoire de Chimie et de Physique des Matériaux (LCPM), Assane Seck University of Ziguinchor-Senegal)

Co-authors: Dr DIALLO, Abdoul Kadri (LCPM/Université Assane Seck de Ziguinchor); Prof. KOBOR, Diouma (University Assane Seck of Ziguinchor); Dr ILAVSKY, Jan (X-Ray Science Division, Advanced Photon Source, Argonne National Laboratory); Prof. LEBRUN, Laurent (LGEF/INSA - Lyon); Dr TOURÉ, Moussa (LCPM/Université Assane Seck de Ziguinchor); Ms FALL, Ndeye Coumba Yandé (LCPM/Université Assane Seck de Ziguinchor); Prof. DOBBINS, Tabbetha (Rowan University)

Presenter: Prof. KOBOR, Diouma (University Assane Seck of Ziguinchor)

Session Classification: Repository - AfLS Poster / Slides - Click on the Blue area - Click on the "View Contribution List" - visit the contribution by clicking on it, you will be taken to the Abstract ... on the right is the Poster / Slides, so you can click on them

Track Classification: AfLS2020 track