Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Understanding the role of A-site and B-site cations on piezoelectric instability in lead–free (1-x) $BaTiO_3 - xA(Cu_{1/3}Nb_{2/3})O_3$ (A = Sr, Ca, Ba) solid solutions[1] DEEPAM MAURYA, YUAN ZHOU, SHASHANK PRIYA, Center for Energy Harvesting Materials and Systems (CEHMS), Bio-Inspired Materials and Devices Laboratory (BMDL), Virginia Tech, Blacksburg, VA 24061 — This study provides fundamental understanding of the enhanced piezoelectric instability in lead-free piezoelectric (1-x) $BaTiO_3$-x$A(Cu_{1/3}Nb_{2/3})O_3$(A: Sr, Ba and Ca and x = 0.0-0.03) solid solutions. These compositions were found to exhibit large longitudinal piezoelectric constant (d_{33}) of ∼330 pC/N and electromechanical planar coupling constant (kp) ∼ 46% at room temperature. The X-ray diffraction coupled with atomic pair distribution functions (PDF)s indicated increase in local polarization. Raman scattering and electron paramagnetic resonance (EPR) analysis revealed that substitutions on A and B-site both substantially perturbed the local octahedral dynamics and resulted in localized nano polar regions with lower symmetry. The presence of nano domains and local structural distortions smears the Curie peak resulting in diffuse order-disorder type phase transitions. The effect of these distortions on the variations in physical property was modeled and analyzed within the context of nanodomains and phase transitions. *spriya@vt.edu

[1]The financial support from National Science Foundation and Office of Basic Energy Science, Department of Energy (Microscopy analysis) is gratefully acknowledged. The authors would also like to acknowledge the support from KIMS (new piezoelectric)

Deepam Maurya
Virginia Tech

Date submitted: 11 Nov 2012 Electronic form version 1.4