Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

BiScO3-PbTiO3 Nanoceramics Prepared by Spark Plasma Sintering XIAOHUI WANG, Tsinghua University — Highly dense 0.37BiScO3-0.63PbTiO3 (BS-PT) ceramics with nano-sized grains were prepared by combination of Spark Plasma Sintering and two-step sintering method. The microstructures, phase and piezoelectric behaviors of BS-PT nanoceramics were investigated. TEM observations clearly showed that the average grain sizes of the ceramic samples were 23, 33 and 70 nm respectively. The contrasting morphologies of grain boundary region under different magnifications were caused by different contrast and imaging mechanisms. HRTEM image confirmed that the samples had dense and thin grain boundary regions. Perovskite phase was demonstrated for all the samples by XRD and SAED data. Local SPM measurements recorded well-formed butterfly and piezoelectric hysteresis loops for all the samples, suggesting that BS-PT nanoceramics retained a ferroelectric state and the polarizations were switchable with the average grain size as fine as 23 nm. There was a comparatively large fluctuation of local piezoelectric responses. A significant difference between local and macro piezoelectric coefficients was observed. The grain boundary regions with complex internal stress and charges/defects were the key factor to understand these unusual properties in ferroelectric nanoceramics.

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Date submitted: 11 Jul 2015 Electronic form version 1.4