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Low-Temperature Transitions in Nanograin Barium Titanate Y-D. WANG, Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia, PA19104-6272, USA, W. DMOWSKI, Department of Materials Science and Engineering, University of Tennessee, Knoxville, TN 37996-1508, USA, X-H. WANG, X-Y. DENG, L-T. LI, State Key Laboratory of New Ceramics and Fine Processing, Department of Materials Science and Engineering, Tsinghua University, Beijing, 100084, China, I-W. CHEN, Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia, PA19104-6272, USA — Nanograin ferroelectrics suffer from diffraction limit that causes line broadening making it difficult to ascertain phase transitions. This, however, may be overcome by analyzing the temperature dependence of line shapes. We investigated the successive low-temperature transitions from tetragonal to orthorhombic to rhombohedral symmetries in nanograin $BaTiO_3$ ceramics using high resolution diffraction and Raman local probe. The existence of orthorhombic and rhombohedral symmetries over a coherent length of the order of grain size, as small as 50 nm, was established by high-resolution diffraction. The coexistence of different symmetries and reduced distortions over different length scales was also evident from both diffraction and Raman local probe. These results explain the broad and rather weak dielectric anomalies associated with these ceramics, which will become important for future dielectric applications in ultrathin multilayer electronic components.

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