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Nonlinear optical detection of mixed phases in Ba(Zr,Ti)O_3 films[1]
YUHANG REN, DAVID ASCIENZO, Hunter College, CUNY, JUN OUYANG, Shangdong University, HUNTER COLLEGE COLLABORATION, SHANGDONG UNIVERSITY COLLABORATION — High energy density, nonlinear dielectrics have attracted intensive research interest because of their outstanding energy storage performances. We report on the detection of phase separated microstructures in Ba(Zr,Ti)O_3 (BZT) films by using optical SHG spectroscopy in the reflection and transmission geometries. The SHG responses clearly show mixed tetragonal (T) and rhombohedral (R) domains at various thicknesses, T-phase and R-phase dominated respectively. The fraction of the R phase increases with film thickness, while the T phase decreased as reflected by the variations of SHG intensities. We reveal that the initial mismatch between BZT film and substrate is extremely important to manage the strain field across the BZT film and therefore phases. The conversion of one phase into another under an external electric field causes extra delay in polarization saturation, contributing to a larger breakdown field on top of the scaling effect.

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