

Ferroelectricity in Ultrathin BaTiO₃ Films: Probing the Size Effect by Ultraviolet Raman Spectroscopy

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Source: PHYSICAL REVIEW LETTERS Volume: 103 Issue: 17 Article Number: 177601 Published: OCT 23 2009

Abstract: We demonstrate the dramatic effect of film thickness on the ferroelectric phase transition temperature T_c in strained BaTiO₃ films grown on SrTiO₃ substrates. Using variable-temperature ultraviolet Raman spectroscopy enables measuring T_c in films as thin as 1.6 nm, and a film thickness variation from 1.6 to 10 nm leads to T_c tuning from 70 to about 925 K. Raman data are consistent with synchrotron x-ray scattering results, which indicate the presence of 180 degrees domains below T_c , and thermodynamic phase-field model calculations of T_c as a function of thickness.