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A COMPARATIVE ANALYSIS OF LATTICE DYNAMIC PECULIARITIES IN BARIUM TITANATE STRUCTURES VIA RAMAN SPECTROSCOPY

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† In memoriam

Strain plays an important role in ferroelectric perovskites, such as barium titanate, strongly impacting their physical and dielectric properties, in particular, phase transition sequences [1, 2]. According to numerous studies, the transition temperature to a paraelectric phase in barium titanate based thin films and superlattices is higher than in relevant bulk materials due to 2D stresses that stabilize the Ti ion positions in the cubic lattice and modify the lattice oscillations as a whole. Thus, studying the lattice dynamics in barium titanate systems is currently among the most popular research directions. Special attention is paid to soft modes that can be monitored via Raman spectroscopy, allowing the phase transition control in these structures [3].

This work is aimed at investigating three types of barium titanate materials, such as single crystal, epitaxial film and BaTiO₃/SrTiO₃ (BT/ST) superlattice, using in situ Raman spectroscopy in a wide range of temperatures as an experimental tool. In particular, a comparative analysis of phase transitions in the above materials has been performed based on $A_1(2TO)$ and $E(1TO)$ soft mode components data in the Raman spectra at different temperatures. Since both components are known to be sensitive to strain in perovskites [1, 4], the information on their behavior in the Raman spectra allows one to evaluate the structural distortions in ferroelectric materials.

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