# Investigations on microstructural and raman scattering properties of $B_2O_3$ doped $Ba(Ti_{1-x}Zr_x)O_3$ nanoceramics

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**Abstract.** 0.5 wt. % $B_2O_3$–doped Ba $(Ti_{1-x}Zr_x)$ $O_3$, (x=0-0.4) lead-free nanoceramics were synthesized using the solid-state reaction method by adopting the ball milling technique. The influence of the substitution content on crystallographic structure, phase transition, microstructure and sintering behaviour of BT and BZT ceramics were investigated. XRD analysis at room temperature revealed a structural transformation from tetragonal to rhombohedral with enhancement of $ZrO_2$ content in the barium titanate matrix. The scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDS) were used to investigate microstructure and surface morphology of the sintered samples. The evolution of the Raman spectra was studied for various compositions, and the spectroscopic signature of the corresponding phase was determined. Scanning Electron Microscope (SEM) observations revealed enhanced microstructural uniformity and retarded grain growth with increasing Zr content.

**Keywords**: $BaTiO_3$, Barium-titanate-zirconate, Nanoceramics, Raman spectroscopy.