

# Synthesis of Lead-Free Ceramics of the Perovskite Type for Piezoelectric Applications by Conventional Solid-State Reaction

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**Abstract:** Structural properties of BaTiO<sub>3</sub>, CaTiO<sub>3</sub> and Ba<sub>0.85</sub>Ca<sub>0.15</sub>Ti<sub>0.9</sub>Zr<sub>0.1</sub>O<sub>3</sub> prepared by conventional solid state reaction technique, at different calcinations temperatures 1100, 1150 and 1280 °C and sintering temperatures (1200 and 1300 °C) are studied. These compositions were selected because of their interesting piezoelectric properties. To follow the decomposition process of the precursor, a differential thermal analysis coupled with thermogravimetric analysis (ATG-ATD) was performed. Structural parameters are analyzed by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The obtained results showed clearly the synthesis of the perovskite phase. The diffractogram illustrates that BCTZ symmetry is both cubic with a Pm-3 m space group and orthorhombic with a R3m space group, the calculated phase rates are respectively 10% and 90%. The results allowed us to specify the effect of sintering temperatures on the structural properties of ceramics.

**Keywords :** Lead free ceramics, synthesis, ;, microstructure, Perovskite