

Role of Particle Size and Reaction Chemistry on the microstructure and properties of Reactively Cold-Sintered BaTiO₃

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BaTiO₃ is a lead-free piezoceramic of growing interest because of the new RoHS regulations on hazardous materials. Hence, there is a growing interest in the sustainable fabrication of BaTiO₃ to be employed in piezoelectric devices e.g., tunable devices for electronic and biomedical applications. Among various sustainable processing routes, Reactive Hydrothermal Phase Densification (rHLPD) is of particular interest. It consists of infiltration, hydrothermal reaction, and reactive crystallization of the titanate from the TiO₂ precursor. The infiltration of Ba(OH)₂ aqueous solution occurs via interconnected pores of an anatase preform, which is converted into BaTiO₃ in hydrothermal conditions. The porosity is filled by reaction products having a higher molar volume than that of the reactants, giving a highly dense BaTiO₃ ceramic. In this work, we investigate the kinetics of the phase transformation and correlate it with the microstructural evolution of the reactively sintered bodies. The effect of the different processing parameters governing the transformation is deeply studied, including temperature, time, composition of the solution, and particle size. The addition of mineralizer (NaOH/KOH) can significantly change the reaction rate as well as the use of different particle sizes, nanopowder green bodies fully converting into the titanate in 48 hr. Structural/electrical characterization studies are underway to confirm the promising potential of this environmentally friendly manufacturing process.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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