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Kinetics and mechanisms on ultrafast high-temperature sintering of barium calcium zirconate titanate

The transition from lead-based to lead-free piezoelectrics is currently a key challenge in the electroceramics community, which aims to find suitable sustainable materials. In the last decade, the solid solution barium calcium zirconate titanate (BCZT) has received increased attention for room temperature applications due to high piezoelectric coefficient and remnant polarisation. The high temperatures and long times required to sinter electroceramics have motivated the use of alternative sintering methods, such as ultrafast high-temperature sintering (UHS). UHS uses a carbon-felt heater in vacuum and Joule effect to enable ceramic densification in minutes, resulting in an out-of-equilibrium process. UHS ceramics typically exhibit fine microstructures and are oxygen-deficient due to heating rates exceeding 10^3 ℃/min and reducing conditions. Precise control of these conditions as well as of electrical current and time is therefore essential to obtain dense ceramics suitable for piezo applications, while avoiding partial melting, trapped porosity and abnormal grain growth. This study comprises a kinetic analysis of BCZT by conventional dilatometry, as well as investigation of the sintering mechanisms operating in the piezoceramics during UHS. For the latter, the evolution of density and grain growth was studied as functions of temperature and time during the UHS process in order to determine the sintering trajectory of the material, in comparison with conventional ceramics.

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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