MICROSTRUCTURE AND DEFECT FORMATION IN $BATiO_3$ CERAMICS OBTAINED BY FLASH SINTERING OF MICRO AND NANOPOWDERS

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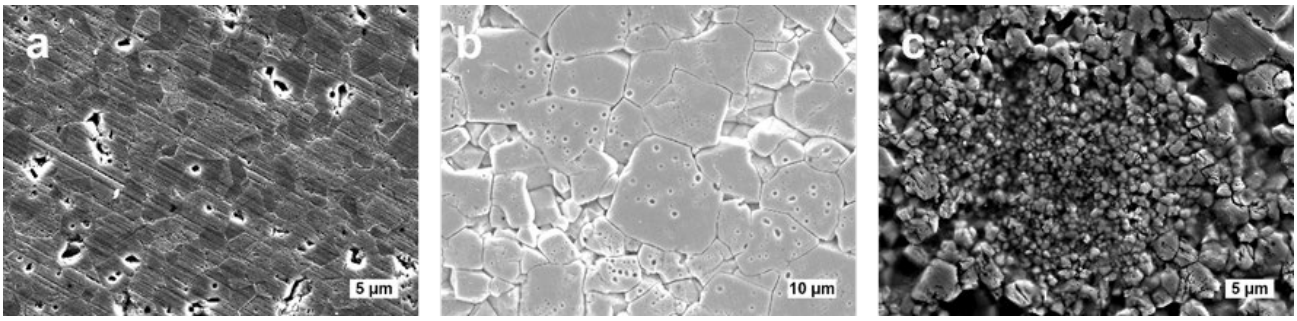
Flash sintering has recently arisen as a novel approach to achieve dense ceramics in an energy efficient manner. It has been widely studied for structural materials but its suitability for functional ceramics is still in open discussion. Since flash sintering involves an out of equilibrium process, it allows to obtain metastable materials and even avoid non-desired phase transitions. However, this fact makes also possible the introduction of involuntary transformations in the sample leading to attain strongly modified microstructures. In this work two $BaTiO_3$ (BTO) green powders with different sizes are used for flash sintering experiments. BTO is a heavily studied functional material that has been regarded as a model of ferroelectric ceramics for decades. The microstructures as well as the functional properties of the sintered specimens are compared and discussed. Results show the existence of functional properties time evolution that depends on the green powder size and the sintering approach. The study of the microstructure evidences the importance of defect generation during flash sintering, which can be influenced by the selection of an appropriate current profile during the incubation stage. These findings could help to achieve a better understanding of the flash event allowing a fine tailoring of the sample microstructure.



SEM micrographs of BTO sintered under different conditions: (a) flash sintering of micropowder (~2 µm) at 150 V/cm and 15 mA/mm²; (b) conventionally sintering of nanopowder (~100 nm) at 1400 ºC for 4 hours; (c) flash sintering of nanopowder at 150 V/cm and 15 mA/mm². Different microstructures are obtained deppending on the green powder and sintering approach.