

Accepted Manuscript

Title: Fast re-oxidation kinetics and conduction pathway in Spark Plasma Sintered ferroelectric ceramics

Authors: M. Legallais, S. Fourcade, U.-C. Chung, D. Michau, M. Maglione, F. Mauvy, C. Elissalde



PII: S0955-2219(17)30512-5
DOI: <http://dx.doi.org/10.1016/j.jeurceramsoc.2017.07.026>
Reference: JECS 11383

To appear in: *Journal of the European Ceramic Society*

Received date: 23-5-2017
Revised date: 21-7-2017
Accepted date: 22-7-2017

Please cite this article as: Legallais M, Fourcade S, Chung U-C, Michau D, Maglione M, Mauvy F, Elissalde C. Fast re-oxidation kinetics and conduction pathway in Spark Plasma Sintered ferroelectric ceramics. *Journal of The European Ceramic Society* <http://dx.doi.org/10.1016/j.jeurceramsoc.2017.07.026>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Fast re-oxidation kinetics and conduction pathway in Spark Plasma Sintered ferroelectric ceramics

M. Legallais, S. Fourcade, U-C. Chung, D. Michau, M. Maglione, F. Mauvy and C. Elissalde

CNRS, Université de Bordeaux, ICMCB

87 avenue du Dr. A. Schweitzer, F-33608 Pessac, France

Abstract

The re-oxidation kinetics of BaTiO₃ ceramics sintered by Spark Plasma Sintering (SPS) was investigated using in-situ impedance spectroscopy. Thanks to the flexibility of the SPS process, the grain size of the dense ceramics was tuned from 0.5 μm to 10 μm. The re-oxidation kinetics are found to be very fast regardless of the grain size and a full re-oxidation of the ceramics are achieved after 20 hours of exposure to an ambient environment at only 600°C. The residual density of charge carriers is reduced when using finer starting powders. SPS ceramics made with micrometer size grains demonstrate a residual charge-carrier density that is one tenth that of ceramics made from 10 μm particles. Grain-boundary conduction is dominant through fine-grain SPS ceramics. This latter feature is similar to BaTiO₃ sintered using the conventional route with 10 μm size grain. Finally, the critical grain size for optimal dielectric permittivity is found to shift from 0.7 μm in standard ceramics to 1.5 μm in SPS ceramics.

Keywords: BaTiO₃, SPS, dielectric properties, Impedance Spectroscopy, oxidation process

1. Introduction

The quest for improved functionalities in ferroelectric ceramics requires a control of composition, microstructure and defect chemistry. Ferroelectric materials which display the highest dielectric permittivities are very sensitive to defects because of the long scale correlation of their lattice features. As a result, a large density of chemical, structural or charged defects can strongly impact the bulk properties, artificially raising the permittivity and strongly increasing the dielectric losses [1, 2]. The sintering step is critical with respect to

Download English Version:

<https://daneshyari.com/en/article/7898693>

Download Persian Version:

<https://daneshyari.com/article/7898693>

[Daneshyari.com](https://daneshyari.com)