

## REACTION FLASH SINTERING FOR PRODUCING HIGH QUALITY FUNCTIONAL CERAMICS WITHIN SECONDS

Luis A. Perez-Maqueda, Instituto de Ciencia de Materiales de Sevilla (CSIC-US), Spain  
maqueda@cica.es

Eva Gil-González, Instituto de Ciencia de Materiales de Sevilla (CSIC-US), Spain

Antonio Perejon, Instituto de Ciencia de Materiales de Sevilla (CSIC-US), Spain

Pedro E. Sánchez-Jimenez, Instituto de Ciencia de Materiales de Sevilla (CSIC-US), Spain

Rishi Raj, Department of Mechanical Engineering, University of Colorado at Boulder, USA

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For ceramic materials, it has been recently shown in literature that applying a small electric field and a small DC current through a sample produces sudden sintering (within seconds) at relatively low temperatures. This method is known as Flash Sintering and it has been applied to number of materials. In this work it is shown that both chemical reaction and sintering can be combined into a single flash sintering experiments. This new approach is known as Reaction Flash Sintering. To demonstrate the feasibility of this method, a multiferroic material, BiFeO<sub>3</sub>, is prepared from a stoichiometric mixture of Bi<sub>2</sub>O<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub> oxides. Thus, in a single process, dense nanostructured BiFeO<sub>3</sub> ceramics are obtained by applying an electric field of 50 V cm<sup>-1</sup> and with a current limit of 35 mA mm<sup>-2</sup> within seconds at a furnace temperature of about 625 °C. The resulting materials were pure-phase perovskites without any evidence of secondary phases, sillenite or mullite, that are commonly present in materials prepared by conventional procedures. Moreover, samples were electrically insulating, as measured by complex impedance spectroscopy.

It is shown here that the synthesis of pure single-phase ceramics of complex oxides from stoichiometric mixtures of single oxides is possible by reaction flash sintering, even for materials difficult to prepare by conventional procedures. This discovery is a breakthrough in materials preparation.