

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/292147500>

# INFLUENCE OF PH ON THE DENSIFICATION OF $BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\gamma}$

CONFERENCE PAPER · AUGUST 2015

READS

3

9 AUTHORS, INCLUDING:



Walter Yoshito

Instituto de Pesquisas Energéticas e Nuclea...

22 PUBLICATIONS 23 CITATIONS

SEE PROFILE



Dayse Dos Santos

São Paulo State University

45 PUBLICATIONS 243 CITATIONS

SEE PROFILE



Luis Gallego Martinez

University of São Paulo

85 PUBLICATIONS 206 CITATIONS

SEE PROFILE



Margarida J. Saeki

São Paulo State University

57 PUBLICATIONS 347 CITATIONS

SEE PROFILE

## INFLUENCE OF PH ON THE DENSIFICATION OF $\text{BaZr}_{0,1}\text{Ce}_{0,7}\text{Y}_{0,1}\text{Yb}_{0,1}\text{O}_{3-y}$

I. V. da Silva<sup>1</sup>, W. K. Yoshito<sup>2</sup>, M. L. Martins<sup>1</sup>, R. U. Ichikawa<sup>2</sup>, D. I. dos Santos<sup>3</sup>, L. G. Martinez<sup>2</sup>, M. A. Centeno<sup>4</sup>, J. A. G. Odriozola<sup>4</sup>, Margarida Juri Saeki<sup>1</sup>

<sup>1</sup> Paulista State University, N/N Rubião Junior District - Botucatu – SP - Brazil. <sup>2</sup> Institute of Nuclear and Energy Research (IPEN), 2242 Lineu Prestes Ave - São Paulo – SP – Brazil. <sup>3</sup> Paulista State University, 14-01 Eng. Luiz Edmundo Carrijo Coube Ave – Bauru – SP - Brazil. <sup>4</sup> Seville University, 49 Américo Vespucio St – Seville - Spain

Studies on proton conductive ceramics have intensified because it makes possible to reduce the operating temperature of Solid Oxide Fuel Cell (SOFC). The perovskite type oxides as  $\text{BaCeM}^{\text{III}}\text{O}_{3-\delta}$  ( $\text{M}^{\text{III}}$  = three valence metals as Y, Yb, Gd, etc) exhibit a good proton conductivity, however, their chemical stability in the presence of acidic gases ( $\text{CO}_2$  and  $\text{SO}_2$ ) is weak. This stability can be provided by doping with zirconium [1] and the conductivity can be improved by yttrium and ytterbium [2]. The conductivity at the grain interface is also a major factor as efficient electrolyte, so that the synthesis method is an important step. Pechini method and their variations, as EDTA-Citrate method [3], are the most methods employed to obtain complex stoichiometry materials. However, this class of methods hinders densification of materials because they retain carbonates. The aim of this work was synthesize  $\text{BaZr}_{0,1}\text{Ce}_{0,7}\text{Y}_{0,1}\text{Yb}_{0,1}\text{O}_{3-\delta}$  by citrate-EDTA method evaluating the influence of pH (~5 and ~8) on the densification. The pH control can provide materials with high porosity, thereby facilitate their better densification. The resins were initially formed and the powders produced by heat treatment at temperatures ranging between 400°C and 1000°C were pelletized. The green pellets were submitted to the densification by treating at the temperature between 1350 and 1550°C. The resulting materials were characterized by XRD, EDX, dilatometry, relative density method (Archimedes) and SEM. The XRD analysis of samples calcined at 1400°C showed that the material synthesized by controlling pH~8 is more symmetrical (rhombohedral phase, R-3c, 167) while that one synthesized under pH~5 showed lower symmetry (monoclinic phase, I2/m, 12). The analysis by EDX confirmed that the composition is close to the nominal one for boths pHs. The pellets synthesized using pH~8 showed lower relative density than the pellets synthesized at pH~5. The SEM analysis corroborated these results.

**Keywords:** Protonic conductor, doped cerate-zirconate, synthesis and densification

### References:

1. E. FABBRI *et al.*, *Science and Technology of Advanced Materials* 11 (2010)
2. L. YANG *et al.*, *Science* 326 (2009) 126-129
3. S. WANG *et al.*, *Solid State Ionics* 213 (2012) 29–35

**Presenting authors email:** mjsaeki@ibb.unesp.br