Influence of the high-energy milling and sintering route on europium-doped ceria properties

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Ceramic electrolytes based on ceria have been extensively researched because the possibility of reducing the operating temperature of solid oxide fuel cells [1]. The ceria doped with rare earth ions (Tr^{+3}), such as $Eu^{+}3$, it is predominantly an ionic conductor in various ranges of temperatures and oxygen partial pressures [2]. In this work, morphological and electrical properties of the compound $Ce_{0,9}Eu_{0,1}O_{1,95}$ synthesized by Pechini method, processed by high energy milling and sintered by two sintering methods (conventional and two-step sintering) were investigated by thermo gravimetric analysis, x-ray diffraction, laser granulometry, scanning electron microscopy, determination of hydrostatic density and spectroscopy impedance. The results showed that the milling step was efficient in powder dispersions improving their sinterability and densification it is also observed that with the route of two-step sintering is possible to obtain dense ceramics without grain growth.

Keywords: Ceria, europia, electrolyte, high energy milling, sintering.

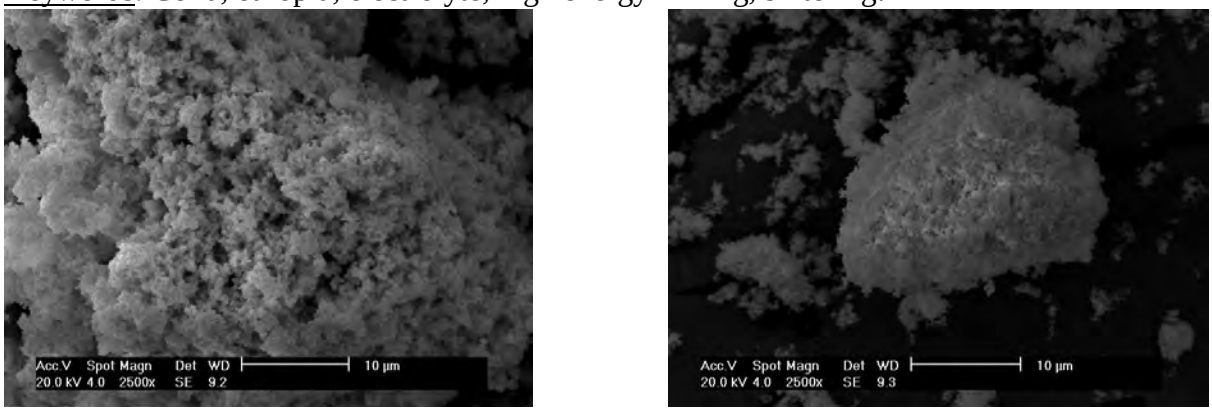

Fig1: SEM micrographs of the particles / agglomerates of powder $CE_{0,9}Eu_{0,1}O_{1,95}$ (a) without milling and (b) with milling.

Sample	Diameter 50% of the particles
$Ce_{0,9}Eu_{0,1}O_{1,95}$ (sem moagem)	5,44 µm
$Ce_{0,9}Eu_{0,1}O_{1,95}$ (com moagem)	0,50 µm

Fig 2: Table of diameters of particles obtained by laser granulometry.

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[1] Solid Electrolytes - general principles, characterization, materials and applications, Ed. P. Hagenmuller, W.Van Gool, Academic Press, New York (1978).

[2] Materials Science and Technology - a comprehensive treatment, V. 11: Structure and properties of ceramics, Ed. R. W. Cahn, P. Haasen, E. J. Kramer, VCH, Weinheim (1994).

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