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# Yttria-stabilized zirconia thick films prepared by mixed method (alcoholic suspension and polymerization route)

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**Abstract** – This work describes the preparation of thick films of yttria-stabilized zirconia (YSZ) with different microstructures, aiming to develop solid electrolytes and coatings for electrodes protection, The objective aim of this work is to establish a route that allows to obtain homogeneous films suitable for these application. Films were prepared by deposition of an alcoholic suspension and by a mixed method combaining alcoholic suspension and polymeric precursor, on alumina or $CeO_2$.Gd substrates and submitted to several thermal treatement (varing temperature and atmosphere). SEM was used to determine morphology the thickness of films. XRD patterns were used to follow phase evolution, and reaction between film and substrate.

Among the all materials which are used to develop solid oxide fuel cells (SOFCs), yttria-stabilized zirconia (YSZ) is the most used electrolyte. This happen because YSZ present a high ionic conductivity, which is combined with to its good chemical stability [1]. In addition, YSZ can be used as protective coat to other electrolytes, like $CeO_2$: Gd.

In this work, thick films of YSZ were prepared onto alumina or $CeO_2$.Gd substrates by a deposition of alcoholic suspension, varying the total solid content (30 wt%, 40wt% and 50wt%). YSZ films were deposited by spin coating ,varying also the number of layers (1 to 3 layers). Films were submitted to thermal treatment at 600, 800 and 1000°C. In addition, a new series of samples was prepared employing a mixed precursor, composed by alcoholic suspension and polymeric resin. It was observed that dense and homogenous films were obtained deposition suspension; however they present a poor mechanical resistance. The addition of the polymeric resin is used to improve adhesion and mechanical resistance. Films deposited onto $CeO_2$.Gd were submitted to heat treatment under reducing atmosphere (2h, 4h and 8h). Changes in morphology (cracks development, porosity, etc.) and phase evolution were used to evaluated the effectiveness of surface protection.

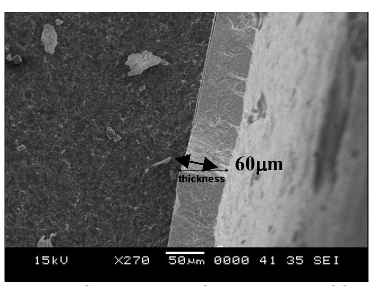


**Figure 1:** SEM image of a thickness of film Calcinated at 1000° C/2h

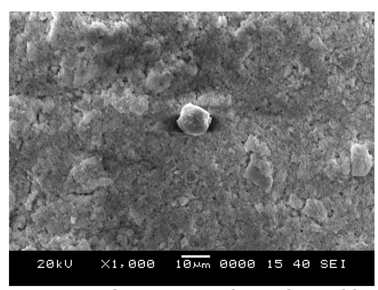


**Figure 2:** SEM image of a surface of film Calcinated at 800° C/2h

[1] Ch. Laberty-Robert, F. Ansart, C. Deloget, M. Gaudon, A. Rousset. Powder synthesis of nanocrystaline $ZrO_2$-8%$Y_2O_3$ via a polymerization route. *Materials Research Bulletin* 36 (2001) 2083-2101.