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Research Article

Characterization of yttria-stabilized zirconia films deposited by dip-coating on $La_{0.7}Sr_{0.3}MnO_3$ substrate: Influence of synthesis parameters

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Abstract: Yttria-stabilized zirconia (YSZ, ZrO_2–8%Y_2O_3) films were deposited onto lanthanum strontium manganite (LSM, $La_{0.7}Sr_{0.3}MnO_3$) substrates using dip-coating process aiming for the application in solid oxide fuel cells (SOFCs). YSZ precursor was prepared by sol–gel method; three values of the organic/inorganic concentration ratio (1, 3 and 5) were utilized and the sol viscosity was adjusted (60 mPa·s and 100 mPa·s) before deposition on the substrate. The influence of these synthesis parameters on the structure and morphology of the deposited films was examined by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The films showed characteristic peaks of LSM, YSZ (with cubic structure) and secondary phases of $SrZrO_3$ and La_2O_3. Depending on the synthesis conditions, crack-free, homogeneous and well adhered films were obtained, with thickness of 11–24 μm.

Keywords: YSZ; films; LSM; sol–gel; dip-coating

1 Introduction

Solid oxide fuel cells (SOFCs) have grown in recognition as a viable high temperature fuel cell technology. SOFC is a complete solid-state device that uses an oxide ion-conducting ceramic material as electrolyte and operates in the temperature range of 800–1000 ℃. When compared with conventional methods of power generation, SOFCs have many advantages, such as higher energy conversion efficiency which can reach up to 65%, easy modular construction, a wide range of fuel possibilities, potential for cogeneration, and life expectancy of more than 40 000 h [1,2]. The current focuses in SOFCs research are material development and reduced-temperature operation.

Yttria-stabilized zirconia (YSZ) is a commonly used electrolyte material in SOFCs due to its pure ionic conductivity, long-term stability, good chemical compatibility with other cell components and excellent mechanical properties [3]. On the other hand, lanthanum strontium manganite (LSM) is the most widely used cathode material due to its high electrical

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