

Effect of Gel Viscosity on the LSM Films Supported on Metallic Substrate

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This work is a part of the research on the synthesis of multilayer LSM (*Lanthanum Strontium Manganite*) thin films for SOFC cathode. The films were prepared by sol-gel route, using a concentration of the transition metal salts in the starting solution of 0.18 mol.L⁻¹. This solution was refluxed at 80°C on a hot plate until a viscosity of 50 or 100 cP was reached. These gels were deposited by dip coating on metallic substrate (SST439 – Cr - 17-19%) at room temperature. After deposition, the LSM/metal-supported composite was heated at 800°C for 2 h. The structure and morphology of the films were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM), respectively, to study the influence of the gel viscosity and the number of layers deposited.

Introduction

Solid oxide fuel cells (SOFCs) are efficient, energy-saving, and environment-friendly energy conversion devices that generate electricity and heat (1-2). The performance of SOFCs can be improved by better control of the morphology and electrochemical properties of the components. Therefore, alternative processes, such as sol-gel processing, chemical vapor deposition, plasma processing and laser ablation have been proposed to improve the contact between the electrode and electrolyte, while retaining its porous microstructure. Among the above methods, the sol-gel process provides several advantages: the microstructure and composition of electrode materials can be controlled with relative ease; low-temperature processing is possible and the electrode and electrolyte adherence is strong (3).

Metal-supported SOFCs have several advantages such as enhancement of mechanical strength and improvement of seal efficiency of stack; however, the significant limits of cell fabrication and cathode performance still exist. It is difficult to conduct co-sintering of cell in oxidizing atmosphere because the main cell component is metallic. Expensive coating technology is also used to avoid oxidation of metal at high temperatures in air (2,4,5).

This work is a part of the research on the synthesis of multilayer LSM (*Lanthanum Strontium Manganite*) cathode thin films for SOFC. La_{0.7}Sr_{0.3}MnO_{3-δ} (LSM) films were prepared by sol-gel method (3) and deposited on metallic substrate by dip-coating. The influence of viscosity and the number of layers on the structure, morphology and thickness of the films was studied.