OXYGEN PERMEATION OF ULTRA-THIN $La_xSr_{1-x}Fe_yCo_{1-y}O_{3-\delta}$ MEMBRANES

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Oxide materials with both ionic (oxygen) and electronic conductivity are of great interest for potential applications in ceramic membranes for oxygen separation, solid oxide fuel cells (SOFC), and catalytic oxidization of C_3H_8 and C_2H_6 gases. For oxygen permeation, mixed-conducting oxides are generally used in a form of thick layers of sintered crystalline grains (i.e. between 0.5 and 2 mm). Ultra-thin layers supported on porous ceramic substrates would be therefore interesting for improving the efficiency of the oxygen permeation and for decreasing the working temperature, the deposition of a catalytic layer being necessary in the case of important surface reactions. For oxygen permeation, O^{2-} conducting multi-metal oxides exhibit appropriate properties. These oxides are mainly perovskites doped compounds $(La_{1-x}A_x)(B_{1-y}B'_y)O_3$ (A= Ba, Sr, Ca – B= Fe, Co, Mn and B'= Ni, Cu) (1-3).

In the present study, ultra-thin gas-tight $La_xSr_{1-x}Fe_yCo_{1-y}O_{3-\delta}$ membranes of 400 nm thickness were obtained from a MOCVD process on porous ceramic substrates of Yttrium Stabilized Zirconia (YSZ) dedicated to these applications. Permeation measurements, X-ray diffraction, scanning and transmission electron microscopy have been used to characterize the obtained membranes. These characterizations indicate the strong adherence between the film and the substrate, and the good properties of oxygen diffusion of such membranes. Also, impedance spectroscopy measurements realized on dense $La_xSr_{1-x}Fe_yCo_{1-y}O_{3-\delta}$ layers deposited by the same MOCVD process on dense YSZ support has permitted to determine different properties of such perovskites materials by varying the values of (x,y).

This work has been carried out under European contract No G5RD-CT2000-00351

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