

Free standing YSZ thin membranes integrated on micro machined Silicon platforms for Oxygen sensors and μ SOFC

F. Chiabrera¹, I. Garbayo^{1,2}, D. Pla^{1,3}, M. Salleras⁴, J. R. Morante^{1,5}, A. Tarancón¹, A. Morata¹

¹ Institut de Recerca en Energia de Catalunya (IREC), SPAIN, amorata@irec.cat; ² Electrochemical Materials, ETH Zurich, Switzerland; ³ LMGP, CNRS-Grenoble INP, France; ⁴ Institut de Microelectrònica de Barcelona, CSIC, SPAIN; ⁵ Departament d'Electrònica, Universitat de Barcelona, SPAIN;

Abstract

A cross plane fully integrated micro oxygen sensor based on a self-sustained ion conducting membrane has been developed. The micro sensors were fabricated combining industrial clean room micro fabrication process and the use of nanometric thin films of Yttria Stabilized Zirconia (YSZ). Large area YSZ membranes of 200 nm thickness were deposited by pulsed laser deposition (PLD) at wafer level. The thermomechanical stability of the self-supported ultrathin membranes was studied by finite element simulation. The PLD deposited membranes integrated in a silicon based platform allows a drastic reduction of the thermal mass and the working temperature, shortening the sensor warm up time. The use of thin film technology diminishes the active part of the sensor, assuring low power consumption and reduced material costs.