

RF Magnetron Sputtered YSZ Thin Film: Fabrication and Characterizations

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ABSTRACT

In order to obtain high ionic conductivity of a solid electrolyte at intermediate temperatures, a very thin dense film is crucial due to its reduced ohmic losses. This work describes the fabrication of yttria-stabilized zirconia (8YSZ) thin films using radio frequency (RF) magnetron sputtering method. The thin films were deposited on carbon paint coated stainless steel foils with varying substrate temperatures (T_s) of 150, 200, 250 and 300°C, while other sputtering parameters i.e. argon gas flow rate, RF power and deposition time were fixed. The sputtering target was sintered YSZ pellets. The deposited thin films thickness ranges from 300 nm to 2 μ m as determined from the scanning electron microscopy. Phase analysis using the X-ray diffraction (XRD) revealed monoclinic, tetragonal and cubic phases of zirconia, and yttria peaks. AC impedance spectroscopy was conducted to measure the bulk resistance of the thin films. Through increasing substrate temperatures, the bulk resistance decreases from 13.76 k Ω for T_s of 150°C to 1.913 k Ω for T_s of 300°C.