DEVELOPMENT of $La_{0.31}Sr_{0.58}Ti_{0.97}Ni_{0.03}O_{3-\delta}$ THIN FILM SOFC MODEL ELECTRODES

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Thin film solid oxide fuel cell (SOFC) anode mixed ionic-electronic conductive (MIEC) $La_{0.31}Sr_{0.58}Ti_{0.97}Ni_{0.03}O_{3-\delta}$ electrodes with and without 200 nm Pt current collectors (CC-s) deposited on 10Sc1CeSZ electrolyte were studied using electrochemical impedance spectroscopy (EIS) at 650 °C in 98.5% H_2 and 1.5 % H_2O at ambient pressure. Pt-10Sc1CeSZ current collectors were also measured separately to determine electrochemical activity of CC-s. The Pt CC-s were prepared using photolitography and magnetron sputtering methods. LSTN layer was deposited using pulsed laser deposition (PLD) technique. Embedded Pt was found to be the most active part of an LSTN model electrode with Pt CC although it is commonly seen that dense MIEC layer covering Pt CC blocks gas access to Pt and makes reaction routes on Pt impossible [1, 2]. In this work, diffusion of H_2 through LSTN and Pt and the formation of entrapped H_2O at Pt-10Sc1CeSZ interface is proposed. It was observed that LSTN + Pt on electrolyte is significantly more active than uncovered Pt on electrolyte or microelectrode without Pt current collectror. This phenomenon is explained by the suppressed decrease of Pt|electrolyte surface activity caused by LSTN MIEC layer. LSTN layer on Pt stabilizes the Pt CC-s structure, inhibits the crystallite and grain growth and helps to preserve the contact between the Pt and electrolyte.

References

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