ELECTROCHEMICAL CHARACTERISTICS AND GAS COMPOSITION GENERATED BY $La_{0.8}Sr_{0.2}Cr_{0.5}Mn_{0.5}O_{3-\delta}$ CATHODE AT ELECTROLYSIS AND CO-ELECTROLYSIS MODES

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High temperature solid oxide devices are very attractive due to the ability to generate electricity while working in the solid oxide fuel cell (SOFC) regime as well as to produce hydrogen via steam electrolysis and/or synthetic fuel via CO_2 and H_2O co-electrolysis if working in the solid oxide electrolysis cell (SOEC) regime[1]. Ceramic materials with perovskite structure have attracted attention as possible redox stable, sulfur- and carbon tolerant cathode materials for solid oxide electrolysis cells[2]. In this study ceramic SOEC single cell was fabricated using impregnation method. $La_{0.8}Sr_{0.2}Cr_{0.5}Mn_{0.5}O_{3-\delta}$-$Zr_{0.94}Sc_{0.06}O_{2-\delta}$ cathode was activated with CeO_2 and Pd nanoparticles and investigated as potential solid oxide co-electrolysis cell cathode at various working temperatures, cell potentials and inlet gas compositions. Based on the electrochemical measurements data the single cell performed the same in co-electrolysis and water electrolysis modes having total polarization resistance 0.52 Ω cm^2 (at 750°C and 1.3 V). Analysis of gas chromatography data shows that the ratio between produced H_2 and CO gases ratio decreased with increasing temperature, from 10.5 to 0.76 at 650°C and 800°C, respectively. Also the H_2/CO ratio decreased with steam content in inlet gas.

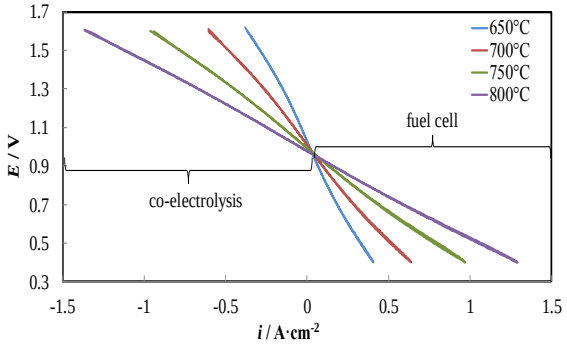

Fig.1 i-E curves measured at potential scan rate 20 mV/s at different temperatures, noted in the Figure. *Hydrogen electrode gas inlet was 48.5% CO_2, 48.5% H_2 and 3% H_2O*[3].

References

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