PERFORMANCE OF THE H_2 /Pt/$Ce_{0.9}$ $Gd_{0.1}$ $O_{1.95}$ /Pt/O_2 INTERMEDIATE TEMPERATURE (500 - 700 °C) FUEL CELL

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$Ce_{0.9}Gd_{0.1}O_{1.95}$ (GCO), is one of the potential candidate electrolytes for Intermediate Temperature Solid Oxide Fuel Cells (ITSOFC). GCO has a higher oxide ion conductivity in the intermediate temperature range (500-700 ° C) compared to other Ce_{1-y} Gd_y $O_{2-y/2}$ compositions and Gd^{3+} ion is the most appropriate dopant material compared to other rare earth materials such as Sm^{3+}, Y^{3+}, Zr^{4+}, etc. In this work, gadolinium doped ceria (GCO) powder, $Gd_{0.10}$ $Ce_{0.90}$ $O_{1.95}$, purchased from Seatle Specialty Ceramics, Inc., was dried for 24 hours at 100 °C, and GCO pellets were prepared. The conductivity measurements were taken in air, in 2 % O_2 in argon, and in 5 % H_2 in argon environments using platinum painted electrodes. I~V characteristics of H_2 /Pt/ GCO/Pt/O_2 fuel cell arrangement was measured using a computerized 34970A data acquisition system with platinum electrodes as the porous anode and the porous cathode in the temperature range of 500 - 700 °C, where 99.999% pure H_2 was used as the fuel at constant flow rate while normal air oxygen was used as reducer at the cathode.

Results show that the fuel cell H_2/Pt/$Ce_{0.9}Gd_{0.1}O_{1.95}$/Pt/O_2 operated within the temperature range of 500 - 700 ° C gives the maximum power densities of 0.0049 W cm^{-2} at 500 °C and 0.0126 W cm^{-2} at 650 °C for cell voltages 0.6275 V and 0.6278 V, respectively, when the electrolyte is kept in 5 % H_2 for 12 hours before using in the fuel cell. The maximum power densities obtained for the same cell are 0.0038 W cm^{-2} at 500 °C and 0.0270 W cm^{-2} at 650 °C for cell voltages 0.5986 V and 0.5913 V, respectively, when the electrolyte is kept in 2 % O_2 for 12 hours before using in the fuel cell.

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