High purity H2/H2O/Ni/SZ electrodes at 500º C

The performance of SOFC (solid oxide fuel cell) anodes is influenced negatively by impurities. In the present study segregation of impurities is minimized by using high purity materials at relatively low temperatures to prevent fast segregation. Ni point electrodes on polished single crystals of stabilized zirconia (SZ) with 10, 13 and 18 mol% yttria and one with 6 mol% scandia plus 4 mol% yttria were studied at open circuit voltage at 400-500 ºC in mixtures of H2/H2O over 46 days. The polarization resistances (Rp) for all samples increased significantly during the first 10-20 days at 500 ºC. No effect of the electrolyte composition on Rp was found. Surface sensitive techniques were used to analyze the composition of the nickel and the electrolytes before and after the electrochemical experiment. Impurities were found to segregate to the surfaces/interfaces, and they are believed to impede the electrode processes and hence to cause the increase in polarization resistance. © 2013 Elsevier B.V.