The Impact of Strong Cathodic Polarization on SOC Electrolyte Materials

One of the most promising reversible energy conversion/storage technologies is that of Solid Oxide Fuel/Electrolysis Cells (SOFC/SOEC, collectively termed SOC). Long term durability is typically required for such devises to become economically feasible, hence considerable amount of work has and is being done on the degradation and long term durability of these systems. When using a SOC in electrolysis mode, it is economically beneficial to operate the cell at high current density, since it increases the fuel production rate. However, several degradation phenomena, such as segregation of impurities at the grain boundaries, electrode poisoning, delamination or cracks of the electrolyte etc., have been observed in cells operated at such conditions, lowering the lifetime of the cell. High polarizations are observed at the electrolyte/cathode interface of an electrolysis cell operated at high current density. In case of a cell voltage above 1.6 V, p-type and n-type electronic conductivity are often observed at the anode and cathode respectively. Hence, a considerable part of the current is lost as leakage through the electrolyte, thus lowering the efficiency of the cell considerably.

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