

Time-dependent stability of SOFC activated by nano-sized cathode electrocatalyst

U.S. Dept of Energy, National Energy Technology Laboratory, Morgantown, WV 26507

Shiwoo Lee, Nicholas Miller, Kirk Gerdes, A. Manivannan

Phone: (304) 285-4594, leesn@nr.netl.doe.gov

Infiltration of nano-scale electrocatalysts can dramatically enhance cell performance by reducing resistance for oxygen reduction reaction. However, the long-term stability of the nano-scale materials at the relatively high SOFC operating conditions has been questioned; and many reports in the literature have presented results showing a very high degradation rate of infiltrated electrode with extended operation time.

Researchers at NETL have completed 1500 h operations for two comparable cells; one having infiltrated cathode and the other as-received from a manufacturer. The SOFC infiltrated with LSCo electrocatalyst showed initial polarization resistance (R_p) of $0.105 \text{ ohm}\cdot\text{cm}^2$, which corresponded to 79% of the baseline cell ($R_p = 0.133 \text{ ohm}\cdot\text{cm}^2$). The cells showed increase in R_p with operation time, displaying a power law relationship with time. Most of the degradation (70% of total degradation) occurred during initial 200 h of operation. The results also showed that the degradation rate of the infiltrated cell was almost identical of that of the baseline cell, implying that nano-particulate electrocatalyst virtually did not affect degradation processes. The results have been supported by multiple tests of cell performance for 200 h.