Degradation phenomena of La0.58Sr0.4Co0.2Fe0.8O3/Ce0.9Gd0.1O2 (LSCF/CGO) cathodes were investigated via post-mortem analyses of an experimental solid oxide fuel cell (SOFC) stack tested at 700 °C for 2000 h using advanced electron microscopy (SEM-EDS, HR-TEM-EDS) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). Similar studies were carried out on non-tested reference cells for comparison. The analysis focused on the LSCF/CGO cathode and the CGO barrier layer, as the cathode degradation can be a major contributor to the overall degradation in this type of SOFC. SEM-EDS and TOF-SIMS were used to investigate inter-diffusion across the barrier layer - electrolyte interface and the barrier layer - cathode interface. In addition, TOF-SIMS data were employed to investigate impurity distribution before and after testing. HR-TEM-EDS was used to investigate possible phase segregation in the LSCF and to look for reaction between the phases. The results show that phase separation and inter-diffusion across the cathode-barrier layer interface and the barrier layer-electrolyte interface happened mainly during sintering and cathode firing, and to a very little degree during the test period.
Keywords: Cathode degradation, LSCF, SEM, SOFC, TEM, TOF-SIMS, Cathodes, Diffusion barriers, Electrodes, Electrolytes, Fuel cells, Mass spectrometry, Organic polymers, Phase separation, Scanning electron microscopy, Secondary ion mass spectrometry, Sintering, Solid oxide fuel cells (SOFC), Transmission electron microscopy, Cathode degradations, Electrolyte interfaces, Impurity distribution, Phase segregations, Post mortem analysis, Time of flight secondary ion mass spectrometry, ToF SIMS, Solid electrolytes

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