La_{0.6}Sr_{0.4}CoO_{3-δ} FUEL CELL MODEL CATHODES - SURFACE CHEMISTRY VS. PERFORMANCE

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In the past decades solid oxide fuel cells (SOFCs) have received growing interest because of their efficient energy conversion, high power density as well as fuel flexibility. One of the most promising cathode materials for intermediate temperature SOFCs (500 - 600°C) is Sr-doped LaCoO_{3} (LSC), which offers both a mixed ionic-electronic conductivity and acceptable catalytic activity for the oxygen reduction. Nevertheless, degradation effects of the electrochemical kinetics can occur that are most likely correlated to changes of the electrode surface.

In this work, La_{0.6}Sr_{0.4}CoO_{3-δ} thin films (200 nm) were prepared via pulsed laser deposition on YSZ (100) substrates and investigated by electrochemical impedance spectroscopy (EIS). For chemical analysis of the surface inductively coupled plasma optical emission spectrometry and mass spectrometry (ICP-OES/MS) were modified to a surface sensitive method by dynamically etching LSC thin films and quantitative online analysis of the eluate cation composition. Hence, depth profiles for the cathode material could be obtained with a resolution reaching the sub-nm range. Results show a water soluble strontium enrichment at the surface which increases with annealing time, indicating formation of a Sr rich second phase. This phase is assumed to block the oxygen incorporation sites and therefore to be responsible for the degradation phenomena.