Catalytic Surface Promotion of Composite Cathodes in Protonic Ceramic Fuel Cells

Composite cathodes based on an electronic conductor and a protonic conductor show advantages for protonic ceramic fuel cells. In this work, the performance of a La$_{5.5}$WO$_{11.25-δ}$/La$_{0.8}$Sr$_{0.2}$MnO$_{3+δ}$ (LWO/LSM) composite cathode in a fuel cell based on an LWO protonic conducting electrolyte is shown and catalytically improved. The limiting processes were first unambiguously associated to surface steps, and the reaction rate was significantly enhanced by 1) tailoring the catalytic activity through electrode surface impregnation with intrinsically catalytic nanoparticles and 2) electrochemical activation of surface species by imposing a net current through the electrode.