Fabrication and Characterization of Metal-Patterned SrCo$_{0.9}$Nb$_{0.1}$O$_{3-\delta}$ Thin Film Cathodes with Well-defined Geometry

IWNETIM ABATE, Minnesota State University Moorhead, WOOCHUL JUNG, Korea Advanced Institute of Science & Technology, SOSSINA HAILE, California Institute of Technology — A major obstacle to the study of fundamental properties of candidate cathode materials is the morphological complexity of the electrode-electrolyte interface in fuel cells. This complexity prevents a true determination of the catalytic mechanisms. To address this challenge, photolithography patterning technique has been used to make considerably simplified and well-defined electrode geometries. However, the time required for such fabrication is extreme. In this work, we employ a simple shadow-mask-patterning method to fabricate a perovskite oxide-metal composite structure. First, a dense thin film of SrCo$_{0.9}$Nb$_{0.1}$O$_3$(SCN) is grown on a Y$_{0.16}$Zr$_{0.84}$O$_{1.92}$ (YSZ) single crystal substrate by pulsed laser deposition. Patterned metal layers are subsequently deposited by DC sputtering with a shadow mask. Thermal stability and electrochemical properties of the fabricated composite cathodes are investigated by optical microscopy, scanning electron microscopy and AC impedance spectroscopy (ACIS).