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A simple microstructure modification strategy for enhanced cathode electrochemical performance

Abstract

A simple strategy of producing well-dispersed $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF) cathode nanopowders that utilizes a dispersing agent is presented. The cathode nanopowder was synthesized by employing a dispersing agent-assisted sol–gel method. Two types of dispersing agents were applied as the synthesizing aids in this study which are the activated carbon (AC) and ethylene glycol (EG). The synthesized cathode powder was systematically characterized by X-ray diffraction (XRD), thermogravimetric analyzer (TGA), field emission scanning electron microscopy (FESEM), and BET surface area analyzer. The electrochemical properties of the fabricated cell were evaluated using electrochemical impedance spectroscopy (EIS). TGA analysis shows that both dispersing agents decomposed below 600 °C. The XRD analysis demonstrates that the single-phase LSCF perovskite is attainable at the calcination temperature of 700 °C for 5 h. FESEM results are in accordance with the BET analysis in which application of the dispersing agents produced more dispersed cathode powders and larger surface area. The electrochemical performances of the LSCF cathode modified with the AC and EG are respectively in the average of six- and eightfolds higher as compared with the pristine LSCF. The dispersing reaction of AC and EG and their influences on the cathode microstructure and performance are also thoroughly discussed. [Figure not available: see fulltext.]