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Characterization of lscf cathode material modified with f-cnts

Abstract

Cathode is one of the important parts in performing the high efficiency of proton conducting fuel cell (PCFC). Selection of appropriate cathode material may resolve the major drawbacks at the cathode part associated with the high Rp. Accordingly, tremendous effort have been done to reduce the Rp and one of the alternatives is the modification of cathode microstructure that can be achieved by introducing dispersing agent in the synthesis route. Thus, in this present work, a functionalized carbon nanotubes (f-CNTs) obtained from acidification process was used as a dispersing agent in the synthesis of $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF) cathode material. The amount of 4 mg, 8 mg and 12 mg of f-CNTs were respectively added to LSCF cathode during the synthesizing process by a sol-gel method. Semi-solid gel obtained was calcined at 900 °C to form high purity of LSCF powder and respectively denoted as LSCF4, LSCF8 and LSCF12. The powder was characterized by Fourier Transform Infrared (FTIR) Spectroscopy, Pycnometer, Particle Size Analyzer and Scanning Electron Microscopy with Energy Dispersive X-ray (SEM/EDX). The FTIR analysis depicted the peak of respective metal complexes, metal oxide, symmetrical and asymmetrical stretching of carboxylate. The pycnometer showed the lowest density of LSCF4 was 2.8777 g/cm^3. The Particles Size Analyzer confirmed the particle size of 38 nm ultrafine powder for LSCF4. The SEM image depicted the highly disperse spherical particles found in LSCF4 with particle size about 30 nm. The elemental composition of the samples is comparable with the nominal stoichiometric of LSCF4 as corroborated by the EDX analysis. Therefore, the LSCF with optimum 4 mg f-CNTs as dispersing agent has potential as nanoporous cathode material for proton conductivity fuel cell.

Keywords

Dispersing agent; F-CNTs; LSCF cathode; Sol-gel