$LiFeO_2$–$LiCoO_2$–NiO materials for Molten Carbonate Fuel Cell cathodes. Part I: Powder synthesis and material characterization

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Received 26 November 2004; received in revised form 15 September 2005; accepted 22 October 2005

Abstract

Ternary compositions of $LiFeO_2$, $LiCoO_2$ and NiO are expected to posses desirable characteristics for the Molten Carbonate Fuel Cell (MCFC) cathode application. This paper presents a detailed description of the synthesis of $LiFeO_2$–$LiCoO_2$–NiO powders as well as dense sintered materials together with a brief discussion on the common aspects and trends observed in the characterization of these materials for MCFC cathode application. Feasibility of two wet-chemical powder preparation techniques, the Pechini method and the glycine–nitrate method, was investigated to obtain powders with characteristics appropriate for cathode fabrication. Materials in the $LiFeO_2$–NiO binary system and five ternary sub-systems, each with a constant molar ratio of $LiFeO_2$/NiO while varying $LiCoO_2$ content, were studied. Powders with characteristics appropriate for MCFC cathode fabrication could be obtained by the Pechini method. The particle size of $LiFeO_2$–$LiCoO_2$–NiO powders considerably depends on the calcination temperature and the material composition. The electrical conductivity study reveals the ability of preparing $LiFeO_2$–$LiCoO_2$–NiO materials with adequate electrical conductivity for MCFC cathode application.

PACS: 82.47.Lh
Keywords: Powder synthesis; Electrical conductivity; Fuel cells; MCFC; $LiFeO_2$–$LiCoO_2$–NiO ternary compositions