

LiFeO₂-LiCoO₂-NiO materials for Molten Carbonate Fuel Cell cathodes. Part II. Fabrication and characterization of porous gas diffusion cathodes

Athula Wijayasinghe^{a,c,*}, Bill Bergman^a, Carina Lagergren^b

^a Department of Materials Science and Engineering, Royal Institute of Technology, SE-100 44 Stockholm, Sweden

^b Department of Chemical Engineering and Technology, Royal Institute of Technology, SE-100 44 Stockholm, Sweden

^c Institute of Fundamental Studies, Kandy, Sri Lanka

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

Abstract

LiFeO₂-LiCoO₂-NiO ternary materials are considered as more viable alternatives to lithiated NiO, in solving the cathode dissolution problem of the Molten Carbonate Fuel Cell (MCFC). This paper presents a detailed description of fabrication and characterization of LiFeO₂-LiCoO₂-NiO porous gas diffusion cathodes for MCFC, together with a brief discussion on the limitations and trends observed in cathode optimization. Several LiFeO₂-LiCoO₂-NiO ternary compositions and a LiFeO₂-NiO binary composition, were fabricated into porous cathodes by tape casting and sintering. The sintered cathodes were subjected to phase analysis, electrical conductivity and pore structural characterization. A bimodal pore structure, appropriate for the MCFC cathode, could be achieved in sintered cathodes prepared using poreformers and sub-micron size powders. The amount of poreformers significantly influences the pore structure and the electrical conductivity of sintered cathodes. Furthermore, this study indicates the nature of the compromise to be made between the electrical conductivity, phase purity, pore structure and porosity in optimization cathodes for the MCFC application.

© 2005 Elsevier B.V. All rights reserved.

PACS: 82.47.Lh

Keywords: Porous gas diffusion electrodes; Electrical conductivity; Fuel cells; MCFC; LiFeO₂-LiCoO₂-NiO ternary compositions
