

Accepted Manuscript

Title: Characteristics of $\text{LaCo}_{0.4}\text{Ni}_{0.6-x}\text{Cu}_x\text{O}_{3-\delta}$ ceramics as a cathode material for intermediate-temperature solid oxide fuel cells

Authors: Yi-Xin Liu, Sea-Fue Wang, Yung-Fu Hsu, Hung-Wei Kai, Piotr Jasinski



PII: S0955-2219(17)30758-6
DOI: <https://doi.org/10.1016/j.jeurceramsoc.2017.11.019>
Reference: JECS 11565

To appear in: *Journal of the European Ceramic Society*

Received date: 14-6-2017
Revised date: 5-11-2017
Accepted date: 7-11-2017

Please cite this article as: Liu Yi-Xin, Wang Sea-Fue, Hsu Yung-Fu, Kai Hung-Wei, Jasinski Piotr. Characteristics of $\text{LaCo}_{0.4}\text{Ni}_{0.6-x}\text{Cu}_x\text{O}_{3-\delta}$ ceramics as a cathode material for intermediate-temperature solid oxide fuel cells. *Journal of The European Ceramic Society* <https://doi.org/10.1016/j.jeurceramsoc.2017.11.019>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Characteristics of $\text{LaCo}_{0.4}\text{Ni}_{0.6-x}\text{Cu}_x\text{O}_{3-\delta}$ ceramics as a cathode material for intermediate-temperature solid oxide fuel cells

Yi-Xin Liu¹, Sea-Fue Wang^{1,#}, Yung-Fu Hsu¹, Hung-Wei Kai¹, and Piotr Jasinski²

¹ Department of Materials and Mineral Resources Engineering, National Taipei University of Technology, Taipei 106, Taiwan

² Faculty of Electronics, Telecommunications and Informatics, Gdańsk University of Technology, Gdansk, Poland

Abstract

In this study, the effects of Cu-ion substitution on the densification, microstructure, and physical properties of $\text{LaCo}_{0.4}\text{Ni}_{0.6-x}\text{Cu}_x\text{O}_{3-\delta}$ ceramics were investigated. The results indicate that doping with Cu ions not only enhances the densification but also promotes the grain growth of $\text{LaCo}_{0.4}\text{Ni}_{0.6-x}\text{Cu}_x\text{O}_{3-\delta}$ ceramics. The Cu substitution at $x \leq 0.2$ can suppress the formation of $\text{La}_4\text{Ni}_3\text{O}_{10}$, while the excess Cu triggers the formation of $\text{La}_2\text{CuO}_{4.032}$ phase. The p-type conduction of $\text{LaCo}_{0.4}\text{Ni}_{0.6}\text{O}_{3-\delta}$ ceramic was significantly raised by Cu substitution because the acceptor doping (Cu'_{Ni}) triggered the formation of hole carriers; this effect was maximized in the case of $\text{LaCo}_{0.4}\text{Ni}_{0.4}\text{Cu}_{0.2}\text{O}_{3-\delta}$ composition (1480 S cm^{-1} at 500°C). Thermogravimetric data revealed a slight weight increase of 0.29% for $\text{LaCo}_{0.4}\text{Ni}_{0.4}\text{Cu}_{0.2}\text{O}_{3-\delta}$ compact up to 871°C ; this is due to the incorporation of oxygen that creates metal vacancies and additional h^\bullet carriers, partially compensating the conductivity loss due to the spin-disorder scattering. As the temperature of the $\text{LaCo}_{0.4}\text{Ni}_{0.4}\text{Cu}_{0.2}\text{O}_{3-\delta}$ compacts rose above 871°C , significant weight loss with temperature was observed because of the release of lattice oxygen to the ambient air as a result of Co (IV) thermal reduction accompanied by the formation of oxygen vacancies. A solid oxide fuel cell (SOFC) single cell with $\text{Sm}_{0.2}\text{Ce}_{0.8}\text{O}_{2-\delta}$ (electrolyte) and $\text{LaCo}_{0.4}\text{Ni}_{0.4}\text{Cu}_{0.2}\text{O}_{3-\delta}$ (cathode) was built and characterized. The Ohmic ($0.256 \Omega \text{ cm}^2$)

Download English Version:

<https://daneshyari.com/en/article/7898800>

Download Persian Version:

<https://daneshyari.com/article/7898800>

[Daneshyari.com](https://daneshyari.com)