

Accepted Manuscript

Structure and electrochemical properties of cobalt-free perovskite cathode materials for intermediate-temperature solid oxide fuel cells

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PII: S0013-4686(18)31119-8

DOI: [10.1016/j.electacta.2018.05.086](https://doi.org/10.1016/j.electacta.2018.05.086)

Reference: EA 31872

To appear in: *Electrochimica Acta*

Received Date: 5 February 2018

Revised Date: 10 May 2018

Accepted Date: 13 May 2018

Please cite this article as: H. Liu, K. Zhu, Y. Liu, W. Li, L. Cai, X. Zhu, M. Cheng, W. Yang, Structure and electrochemical properties of cobalt-free perovskite cathode materials for intermediate-temperature solid oxide fuel cells, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.05.086.

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1 **Structure and electrochemical properties of cobalt-free perovskite cathode**
2 **materials for intermediate-temperature solid oxide fuel cells**

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11
12 **Abstract**

13 Cobalt-free perovskite oxides, $\text{BaFeO}_{3-\delta}$ and $\text{BaM}_{0.05}\text{Fe}_{0.95}\text{O}_{3-\delta}$ ($\text{M} = \text{Ti}, \text{Zr}$ and Ce),
14 were prepared as the cathode of intermediate-temperature solid oxide fuel cells
15 (IT-SOFCs). High temperature X-ray diffraction (HT-XRD) results show that
16 $\text{BaFeO}_{3-\delta}$ and $\text{BaTi}_{0.05}\text{Fe}_{0.95}\text{O}_{3-\delta}$ (BTF) have a complex phase composition, and the
17 phase composition changes with temperature. $\text{BaZr}_{0.05}\text{Fe}_{0.95}\text{O}_{3-\delta}$ (BZF) has a cubic
18 perovskite structure above 400 °C, while $\text{BaCe}_{0.05}\text{Fe}_{0.95}\text{O}_{3-\delta}$ (BCF) has a cubic
19 perovskite structure from room temperature (25 °C) to 1000 °C. Thermogravimetric
20 analysis (TG) and oxygen temperature-programmed desorption (O_2 -TPD) analysis
21 reveal that the phase transition affects the oxygen-release properties of these materials.
22 In contrast to $\text{BaFeO}_{3-\delta}$ and BTF showing phase-transition-dependent electrical

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