

UNIVERSITI TEKNOLOGI MARA

**IN-SITU X-RAY DIFFRACTION
STUDIES FOR THE LaSrFeO_3 -
 $\text{Ba}(\text{Ce,Zr})\text{O}_3$ CATHODE COMPOSITE**

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Thesis submitted in partial fulfilment
of the requirements for the degree of
Bachelor of Science (Hons.) Physics

Faculty of Applied Science

July 2020

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as reference work. This thesis has not been submitted to any other academic institution for any degree or qualification.

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ABSTRACT

Owing to its high-power performance, solid oxide fuel cell (SOFC) is highly efficient in energy production. However, its high operation temperatures ranging from 800°C to 1000°C increase the cost which prevents its applications from expanding. Proton conducting fuel cell (PCFC) was developed, as it can work at intermediate temperature ranging from 400°C to 800°C. Due to reduced activation energy and comparatively elevated proton conductivity at intermediate temperature, PCFC can boost durability and performance. In this study, $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$ - $\text{BaCe}_{0.54}\text{Zr}_{0.36}\text{Y}_{0.1}\text{O}_{3-\delta}$ (LSCF-BCZY) was used as composite cathode. By using the Rietveld refinement method, the structure parameters of LSCF-BCZY were determined at different temperatures from room temperature to 700°C, resulting in fulfilment of the phase refinement requirement. The goodness of fit fill the necessity below four. The materials' XRD shows orthorhombic crystal symmetry for LSCF and cubic crystal symmetry for BCZY with space group $Pbnm$ (the name indicates a primitive lattice with b-glide plane perpendicular to the x-axis, n-glide plane perpendicular to the y-axis and mirror plane perpendicular to the z-axis) and $Pm-3m$ (the name refers a primitive lattice with mirror plane perpendicular to x-axis, y-axis and z-axis, them threefold symmetry of body diagonals), respectively. Other structural studies have been using the Rietveld refinement process, such as space group, lattice parameters and crystal structure. All the properties studied here suggest it may be a promising candidate of cathode at intermediate temperature for PCFC.

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