



Contribution ID: 274

Type: **not specified**

Pb-doped Bismuth Oxide Electrolyte Materials for Intermediate Temperature Solid Oxide Fuel Cells

*Thursday, 21 November 2024 17:15 (15 minutes)*Emileo Naicker¹, Caren Billing^{1,2}, David G. Billing^{1,2}¹ Molecular Science Institute, School of Chemistry, University of the Witwatersrand, Johannesburg, South Africa² DSI-NRF Centre of Excellence in Strong Materials, University of the Witwatersrand, Private Bag X3, Johannesburg, 2050, South Africa

emileo.naicker1@students.wits.ac.za

Fuel cells provide a way to convert chemical energy into electrical energy. The electrolyte used is one of the components that can be optimized to enhance the operation of the fuel cell. There are different types of electrolytes with the most common electrolyte used being yttrium stabilized zirconia. This work focuses on using doped bismuth oxide as an electrolyte due to its extremely high conductivity in its face centered cubic (fcc) structure while using specific dopants in a triple doped system (Y^{3+} , Ce^{4+} and Pb^{2+}) to promote certain characteristics with particular focus on Pb^{2+} for increasing conductivity. Variable Temperature electrochemical impedance spectroscopy (EIS) and Powder x-ray diffraction (PXRD) were both used to determine the conductivity performance and structural stability. It was revealed that increasing the Pb^{2+} concentration of the system, while fixing the concentration of the other dopants, resulted in increased conductivity. The linearity of both samples on the Arrhenius plots showed that there was not any major phase change. However, it seems that at higher temperatures, lead migrates away from the cubic structure which was revealed with VT-PXRD as the diffraction pattern showed a degradation of the cubic structure and discolouration of sample.

Primary author: NAICKER, Emileo (Student at The University of the Witwatersrand)**Presenter:** NAICKER, Emileo (Student at The University of the Witwatersrand)**Session Classification:** AfLS Contribution**Track Classification:** AfLS