

**INVESTIGATION OF CeO-BaO CATALYST MATERIALS FOR
METHANE-FED PROTON CERAMIC FUEL CELLS: DC
CONDUCTIVITY IN HYDROGEN AND SURFACE STABILITY IN
METHANE**

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This Final Year Project Report entitled **"Investigation Of Ceo-Bao Catalyst Materials For Methane-Fed Proton Ceramic Fuel Cells: Dc Conductivity In Hydrogen And Surface Stability In Methane"** was submitted by Nuratiqah Asyiqin Binti Mohd Nasharudin in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

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Dry Methane Reforming (DRM) is an important method in hydrogen production and reduces greenhouse gas emissions. DRM utilizes methane and carbon dioxide then produces syngas, a mixture of hydrogen and carbon monoxide. However, carbon deposition often restricts catalyst's performance. Carbon buildup will block catalyst pores, reduce efficiency and increase operational costs. To address these issues, this study focuses on the CeO-BaO catalysts. CeO-BaO has great thermal stability and resistance to carbon deposition. In this research, there are two objectives which are i) To synthesize CeO-BaO catalysts using sol gel method and ii) To investigate the surface stability and electrical conductivity in H₂ atmosphere of CeO-BaO catalysts using FTIR, Raman and DC surface conductivity. Different CeO-BaO compositions were prepared and analyzed to understand their chemical structure and bonding. DC conductivity results showed the 60:40 CeO-BaO composition had the highest conductivity. Due to the composition that has good balance of oxygen vacancies and ionic movement. Raman analysis also confirmed that CeO-BaO remain stable and there are no major signs of degradation after CH₄ exposure. These findings contribute to the development of potential support materials in PCFCs operating in methane fuel.

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