# Performance Evaluation of Solid Oxide Fuel Cell by Computer Simulation

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## Abstract

*The search for sustainable energy source that can compete with the existing one led to the discovery and acceptance of fuel cell technologies as a perfect replacement for fossil fuel. The ability of Solid Oxide Fuel Cells (SOFC) to capture the heat generation during the process of energy generation from electrochemical reactions favoured their recognition as a promising alternative energy source. This study therefore, focuses on the investigation of operating parameters on the SOFC performance through computer simulation of the developed mathematical model. This is achieved by simulating the effects of operating parameters on the SOFC performance. The results of computer simulation obtained reveal that pressure of the fuel, pressure of the oxidant and concentration of the fuel positively affects the SOFC performance. Analyses of these results also show that the operating temperature negatively affects the performance of the cell, for instance as cell temperature increases from 800oC to 1000oC the cell voltage decrease from 0.8402 V to 0.8400 V. The simulation of the cell efficiency also indicates that all the parameters investigated via computer simulation also affect the efficiency of the fuel cell with maximum heat generation of 19000 kJ. The developed model can be employ to predict SOFC performance at different operating conditions.*

***Keywords:*** Alternative energy, technologies of fuel cells, mathematical modeling, computer simulation and solid oxide fuel cell.

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