

## MATHEMATICAL MODELING AND PERFORMANCE SIMULATION AND OPTIMIZATION OF MOLTEN CARBONATE FUEL CELL (MCFC)

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### Abstract

A mathematical model for the molten carbonate fuel cell was developed using basic governing equations and chemical reactions based [15,23], in Mat-lab software. Using this model, the contribution of different cell components to losses in cell performance has been studied. In general, at low current densities, the electrolyte matrix contributed to the major fraction of potential losses. Using the model, the maximum power density from a single cell for different cell thicknesses and pressure and temperature was determined. Matrix thickness played a critical role in determining cell performance. Reducing the thickness improved the performance but reduced the life of the fuel cell. Using the model, the maximum efficiency a single cell for different cell pressure and temperature was determined. The Optimize results are obtained using genetic and PSO algorithm. PSO algorithm take less time to optimize the results as compare to genetic algorithm.

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**Keywords:** MCFC, Mathematical model, Simulation, Optimization, Genetic/ PSO Algorithm.