

## CHAPTER VI

### CONCLUSIONS AND RECOMMENDATIONS

Study of the effects of the diluents and various syngas compositions on the cell performance of a PSOFC one-cell stack showed that at 800°C and 1 atm CO<sub>2</sub> has the most negative effect on the cell performance when compared to other diluents, N<sub>2</sub> and CO. SEM images presented a change in anode morphology, while EDS spectrums indicated that there was some carbon deposited on the anode surface. After the experiment, at the near inlet region, the anode surface was delaminated, while near the outlet region, the cell was slight discoloration.

The non-isothermal 2D model of a single cell PSOFC along the flow channel operating with syngas was developed to predict the cell performance and investigated phenomena occurring inside the flow channel. The model considered among the anode and cathode as boundary of the electrolyte indicated that the model had a good agreement (similar trend) to the experiment for various syngas compositions. The simulation results of species distribution showed that the WGS reaction played an important role at the inlet region which converts H<sub>2</sub> and CO<sub>2</sub> back to CO and H<sub>2</sub>O, resulting in a cell performance decreasing.

Since the model was based on many assumptions to predict the trend of the cell performance only, therefore, the precise cell performance, very complicated models, viz. 3D model, including accurate parameters are required.