

# CHAPTER 5

## Conclusion and Future Work

### 5.1 Conclusion

1. In this study, parallel-channel flow field plate with stainless steel is adopted for the cathode side of DMFC. The cross-sectional dimensions of channels are  $500 \times 1000 \mu\text{m}$ . Through the glass plate covering the through channels, the dynamic processes of vapor condensation and water transport in the channels can be visualized. Vapor appears on the surface of GDL and small water drops first appear on the glass surface. They grow gradually and coalesce into bigger ones. As the drops touch with the channel corners, they will be drained into the water film having formed therein and disappear rapidly. Assisted by the air flow, the condensed water can be effectively transported downstream via the channel corners by the capillary force.
2. Comparisons have been made with the stainless steel plate uncoated and coated with gold, respectively. The maximum current and power output for uncoated stainless steel plate is  $68.3 \text{ mA/cm}^2$  at  $0.016 \text{ V}$  and  $7.26 \text{ mW/cm}^2$  at  $0.272 \text{ V}$ , respectively. The maximum current and power output for gold-plated stainless steel plate is  $95 \text{ mA/cm}^2$  at  $0.016 \text{ V}$  and  $13.2 \text{ mW/cm}^2$  at  $0.272 \text{ V}$ , respectively. The performance of gold-plated stainless steel is better as a result of better electric conductivity and surface hydrophilicity.

## 5.2 Future Work

1. For visualization, a glass plate covering the cathode channels was used. To avoid fracture of the glass plate, the clamping pressure was maintained at a limited level. Better performance of DMFC is expected with a larger clamping pressure. This will be done without compromise for glass fracture when visualization is unnecessary.
2. Electric discharge manufacture causes stainless steel deformation due to high temperature. Titanium plate will be substituted because the titanium is less deformable at high temperature. Besides, the gold layer is bonded more tightly on titanium.

