



## CHAPTER V

### CONCLUSION AND RECOMMENDATION

The main objective of this work is to enhance proton transfer efficiency of polymer electrolyte membrane for the anhydrous system at high temperature under the layered-by-layered concept. Heterocyclic molecule is the proton conductive species and demonstrates the good properties such as high thermal property and hydrogen bond interaction. In addition, acid functional group is capable of proving protons, which have an influence on the proton conductivity. This work proposes the combination of proton donor-acceptor with uniform molecular arrangement of heterocycles and acid functional group.

Therefore, in this research, the SPEEK membrane used as backbone part is alternatively immersed in both poly (acrylic acid) solution as a proton donor and MPEI solution as a proton acceptor and dried at room temperature to obtain multilayer polymer membrane with varied number of layers.

The present work demonstrates that the LBL SPEEK membrane demonstrates the proton conductivity with increasing number of proton donor-acceptor layers is  $5.213 \times 10^{-7}$  S/cm,  $2.02 \times 10^{-6}$  S/cm,  $2.96 \times 10^{-6}$  S/cm, and  $1.378 \times 10^{-5}$  S/cm, respectively at 130 °C. The LBL technique can provide ordered structure resulting in the strong hydrogen bond network and leading to the increment of proton transfer channel for enhancing proton conductivity of LBL SPEEK membrane.