

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### **Conclusions**

This study investigates the effect of surfactant and focus on microstructure of carbon derived from polybenzoxazine. The purpose of this work was to produce the novel organic and carbon xerogel from aromatic benzoxazine 4,4-Diaminodiphenylmethane but the result is organic xerogel cannot change to the carbon xerogel, the product of carbonization was fusion of organic xerogel. According to the average density of MDA (0.86 g/cc) is higher than TETA (0.76 g/cc) which can turn to be carbon xerogel. By using non-ionic surfactant (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol)), the organic xerogels derived from polybenzoxazine with tunable pore structure were successfully synthesized by a facile synthesis process with shorter preparation time. When (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol)) was used as a surfactant, mesoporous carbon xerogels with wide range of mesopore diameter were obtained by changing the concentration of (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol)). Narrow range of mesopore diameters of 3.59, 4.58, 3.59, and 3.59 nm were achieved for (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol), concentration of 0.003, 0.009, 0.030, and 0.090 M, respectively. Organic xerogel with (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol) concentration of 0.030 M was showed the highest mesoporosity of 0.11 cc/g and 0.090 M was showed the highest BET surface area of 19 m<sup>2</sup>/g. Moreover, the macropore volume was increase when increase the concentration of surfactant. Wide range of micropore diameters of 0.37, 0.37, 0.50, and 1.00 nm were achieved for (Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol), concentration of 0.003, 0.009, 0.030, and 0.090 M, respectively.

**Recommendations**

1. The effect of concentrations of surfactant is not significantly affect to microstructure when using 4,4-Diaminodiphenylmethane as a precursor. Therefore, should change to the other effect to study microstructure of this amine.
2. The effect of the length of time to drop amine and chemical is significantly affect to the gelation of the product.