

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

A polybenzoxazine xerogel precursor was synthesized from bisphenol-A, formaldehyde, and aromatic diamine. Humic acid 0.1 wt% was coated on the precursor at room temperature via the layer-by-layer polyelectrolyte multilayer (PEM) surface modification method using poly(diallyldimethylammonium chloride) (PDADMAC) and poly(sodium 4-styrenesulfonate) (PSS) as primer coating for 4 layers. It was found that the absorbance of the prepared samples increased when the number of PEM layers increased. Hence, it could be investigated that humic acid was coated on the surface of polybenzoxazine xerogel precursor. Humic acid was used to study its ability to remove copper content by adding of Copper(II)acetate at pH7 to the coated xerogel. The results indicated that copper was adsorbed on the humic surface due to the electrostatic complex formation between deprotonation of carboxylic to carboxylate in humic acid and copper ions. When the injection time of copper was increased, the absorbance of residual copper after the adsorption was decreased because of more copper ions can be formed with the humic surface.

#### Recommendations

For the thickness control of PEM layers, it was quite difficult to control the thickness of each layer by hands, so using of the machine instead of hands could be resolved this problem due to its higher accuracy. And for the further work, the ability to remove copper from each humic acid layer of the prepared samples should be studied for more details resulting in obviously comprehend.