CHAPTER V

CONCLUSIONS

The functionalized mesoporous silica with four types of Schiff's base ligands such as salen, saltn, salophen and haen was successfully synthesized by doping technique via sol-gel process. The maximum amounts of Schiff's base that could be incorporated in 1 mole of synthesized mesoporous silica were found to be 90.6, 43.5, 58.6 and 67.0 mmole for salen, saltn, salophen and haen, respectively. The results obtained from FT-IR technique exposed the presence of incorporated Schiff's base in all modified silica. The physical properties of the doping materials were investigated using X-ray diffraction technique and N_2 sorption analysis revealed the regular arrays of lamellar mesopore structure of these materials with high surface area, large pore volume and narrow pore size distribution. Also, the regular morphology of these sorbents was observed from SEM results. In addition, from Malvern laser diffraction technique, it could be concluded that all silica had narrow particle size distribution.

For the metal extraction properties, all Schiff's base doped mesoporous silica were capable of extracting Cu(II) and Fe(III) even at low pH values, while these materials could extract other metal ions including, Co(II), Fe(II) and Mn(II) when the pH of metal solution was about 4 to 5. The presence of salts, especially $NaNO_3$ and NaCl, in metal solution enhanced significantly the metal extractability of the sorbents. The mass of silica used for the metal extraction also had an effect on the metal uptake. Considering the selectivity of materials, all Schiff's base doped mesoporus silica showed great selectivity to the extraction of Fe(III). A comparison of metal extractability of these materials revealed that the saltn doped mesoporous silica had higher capacity than that of salen, salophen and haen doped mesoporous silica, respectively. The metal extraction efficiency of saltn doped mesoporous silica could be explained by the facility of these Schiff's bases to act as a tetradentate ligand and hence promoted the formation of saltn-metal complex. For the complete desorption of Cu(II) and Fe(III), the required concentration of nitric acid should be at least 0.1 M.

Suggestions for future work

1. The synthesis of novel Schiff's base doped mesoporous silica using various types of Schiff's base ligands such as S-containing Schiff's base for use as a new sorbent in metal extraction.

2. The study of the metal extractability of Schiff's base doped mesoporous silica using column or dynamic method.