CHAPTER I

INTRODUCTION

The trace metal contaminated in environmental samples is a serious problem to human health, living resources and ecological system. Therefore, the treatment of wastewater before being release to the surroundings is necessary. Solid-phase extraction (SPE) is one of a technique that could be used for the removal of such metal ions. This SPE method possesses several advantages: large preconcentration factor, simplicity of phase separation and suitability for automation [1-3]. Since the major factor contributing to the SPE technique is a solid support or sorbent, the development of this SPE technique could thus be performed by modification of the sorbent properties. Among several materials, silica is the most popular sorbent due to its high chemical stability, good mechanical strength and hydrophilic properties. However, traditional silica has some common limitations such as low binding strength, selectivity and low resistance to chemicals. To overcome the above limitations the modification of silica surface with extractant molecules is often necessary.

Chemical doping, one of a technique that could be used to modify the surface of silica, is gaining the popularlity due to its several advantages i.e. high selectivity imparted by entrapped complexing or chelating reagents, easy preparation, low synthesis temperature requirement and fast equilibration of material [4]. Moreover, this method provides a stability to material due to the reduction of the leaching problem of organic molecules [5, 6]. For the extractant molecules, HPMSP is a selective ligand due to its celebrity as an effective complexing agent. This molecule can form different types of coordination compound due to its several electron-rich donor centers and tautomeric enol and keto form. Furthermore, it has frequently been used as a reagent for metal extraction [7, 8].

The functionalization of silica by HPMSP molecules using doping technique was first introduced by Intasiri [9]. Ever since, many researches were focused on the preparation of HPMSP doped microporous or mesoporous silicas for using as a sorbent in the extraction of metal from aqueous solution. However, the parameters affected the synthesis, the physical properties and the metal extraction behaviors of these HPMSP modified silicas were not well understood. Furthermore, most

extraction processes were focused on some metal ions and performed by only batch experiment.

Thus, in this work, much more parameters such as types of silica precursor and amounts of surfactant used for the synthesis of HPMSP doped mesoporous silica were evaluated. The physical properties and the sorption behavior of all synthesized materials was also determined to acquire the most effective sorbent. This silica was then subjected to the profound study on its Cu(II) extraction properties using SPE column experiment. The extraction efficiency of this HPMSP modified sorbent towards other metal ions were next examined. The removal of metal ions from wastewater sample using this HPMSP doped mesoporous silica was also demonstrated in the last section.