

## CHAPTER I

### INTRODUCTION

The solvent extraction and separation of metal ions in the presence of organic compound as an extractant molecule is frequently reported in the literature [1-3]. However, classical extraction methods are usually time-consuming, labor-intensive and tedious method. Thus, the focus on the replacing of conventional solvent extraction method is much interest. Solid-phase extraction (SPE) is an attractive technique due to several advantages. This method reduces consumption step, large volumes of solvent and extraction time. Furthermore, SPE can be routinely used in various researches and application area. However, this method is still in need of development to increase its efficiency. A key parameter of SPE technique is the sorbent or the solid support, hence, the development of sorbent for the selectivity extraction, preconcentration and determination of metal ions is a challenging task. Several types of solid support have been introduced in the commercial products such as silica, alumina, polymeric resin, *etc.* Among the different sorbents, silica is the most commonly used sorbent, due to its relative inertness, high mechanical strength and thermal stability, strain or not swell in aqueous solution [4, 5]. However, commercial silica lacks of selectivity, especially, for metal extraction. Therefore, the selectivity increasing for silica has been the subject of considerable interest.

Nowadays, the route used to enhance the selectivity for silica has various methods such as chemical derivatization or covalent grafting, impregnation and doping technique. In recent years new materials developed using doping method through sol-gel process is gaining popularity due to the fact that the sol-gel route can occur in liquid solution at the room temperature [6]. Also, this method provides stability to material and can reduce the problem of the leaching of organic molecules from silica. Thus, the silica synthesis using doping technique via sol-gel process is an interesting method.

In previous papers, various researches dealt with the potential use of chelating ligands immobilized on the silica gel to enhance the selectivity for metal extraction [7-10]. Schiff's bases are widely used ligands because they are well known as ligands that are easy to be synthesized and have structure rigidity, and they were used also as selective extraction reagents for several kinds of metal [11-14]. In addition, these

ligands show very stable complexes with metal and are also obviously favorable for the formation of 1: 1 square-planar complex [15, 16]. However, among previous research performed on the preparation of materials for use as a sorbent in metal extraction, the modified silica using Schiff's base ligands as a functionalized molecule was very limited. Thus, in this work, the synthesis of the functionalized mesoporous silica using doping technique *via* sol-gel process to encapsulate a tetradentate Schiff's base ligand into the silica is performed. Also, the morphology and crystallinity of the synthesized silica are investigated. In addition, the study of the sorption behavior of the obtained silica towards transition metal from aqueous solution is carried out.



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