CHAPTER I
INTRODUCTION

The presence of heavy metals and organic pollutants in various surface water or ground water as industrial or laboratory wastes has been of great concern because of their toxic effect on plants, animals and human beings. Therefore, effective removal of heavy metals from water or various industrial effluents is very important and has attracted consi- derable research and practical interest. There are several methods including chemical precipitation, ion exchange, electrodeposition, reverse osmosis and adsorption, etc., have been used to remove heavy metal ions from various aqueous solutions. Among these methods, adsorption process has increasingly received more attention in recent years because the method is simple, relatively low cost and effective in removing heavy metal ions, especially at medium to low metal ion concentrations and form wastewaters.

One of the interesting materials for using in wastewater treatment is porous clay heterostructures (PCH) due to their large surface area, unique combined micro- and mesoporosity, and well-modified surface properties. These porous materials which are obtained by combining the pillaring and template approaches, are formed by the surfactant-directed assembly of mesostructured silica within the two-dimensional galleries of a 2:1 phyllosilicate host such as fluolohectorite, vermiculite, and mont- morillonite. In the first step, cationic surfactant templates and neutral amine co-surfactant are intercalated between the sheets of the clay plates forming micelle templates. Subsequently, the silica sources are formed by polymerization around the micelle structures. Finally the surfactant templates are removed from the as-synthe- sized PCH either by calcinations or chemical extraction to obtained the mesoporous materials.

Mesoporous materials of interest for the removal of toxic heavy metals, such as mercury, cadmium, zinc, chromium, and lead, are based mostly on mesoporous silicates functionalized with mercaptopropyl surface groups. The thiol functionalities, which exhibit a high affinity for these metals, have been incorporated with mesoporous materials either by grafting (also known as post-synthesis) or by co-condensation (also known as direct synthesis) techniques. Furthermore the func-

tionalization of mesoporous silica with *N,N* - dimethyldecylamine has also been prepared to use as the organic pollutants adsorbents.

All above ideas lead to this research work, we have focused on the synthesis of mesoporous materials from Na-bentonite clay, which is the available local clay minerals. These mesoporous materials were functionalized with 3-mercaptopropyltrimethoxysilane (MPTMS) and *N,N*-dimethyldecylamine (DMDA) for utilizing as heavy metals and organic pollutant adsorbents for wastewater treatment,respectively. Subsequently, the functionalized PCH was investigated the adsorption properties which concerned with their function as adsorbents for aqueous solution.