CHAPTER I

INTRODUCTION

There has been a great deal of concern about the environmental and biological effects of heavy metal pollution in the hydrosphere. Because of its extent and volume, the hydrosphere could be considered as an ideal disposal site for most wastes produced by man. Several investigations have been performed on the measurement and monitoring of metallic waste products in the marine samples. More must be completed so that an access to protect the marine environment from this type of pollution could be approached.

Among the metals or metal compounds that could affect the marine environment, the present study will deal with Cd, Cu, Pb and Zn .

Cadmium is always present in metallurgical processes of zinc and is undeniably a health risk. In liquid medium, contamination of man occurs through contaminated food which is observed in kidney and bone disease (Itai-Itai disease).

The toxicology of zinc is less dependent on the risks of poisoning by zinc itself than on the effects caused by the presence of other associated metals, such as arsenic, cadmium and lead. Certain synergetic effects were discovered in the

interaction of cadmium in sea water in the presence of zinc. The repercussion on the environment on such effects are not yet understood at the present time.

The toxicity of lead is chronic. Lead (Pb^{2+}) precipitates at pH6.0, so that lead salts are generally rendered insoluble in sea water at pH8.1 $\pm$ 0.2. The concentration of lead in sea water should be, consequently, very low. It represents, therefore, an interesting and challenging case for the analytical chemists in the establishment of an accurate and precise analytical method for lead in sea water.

Copper is a common element found in effluents of industrial origin. The natural concentration of copper in sea water is about 1-9 $\mu g/dm^3$ (1). The absorption of copper salts in food over a long period are regarded as dangerous. Functional disturbances of the mascular and nervous system are among the symptoms shown. Copper is therefore one of the most widely studied metals.

In the aquatic medium, especially in sea water where the concentrations of most of the toxic metals lie between 0.1-10 $\mu g/dm^3$ and the salt content is very high, preconcentration of the toxic metals prior to measurement is necessary. Ionexchange-resin and reverse phase chromatography are among the most popularly applied techniques.

Ion exchange resin (chelex-100) is especially appropriate for the concentration of trace elements in sea water.

It permits the treatment of large volume of sea water (e.g. 10 dm^3) and yields a concentration factor of 500-1000 times its original strength. Such results are rarely achieved by extraction with organic solvents by reason of the practical impossibility of application to such large volumes of water.

Reverse phase chromatography permits a rapid and simple concentration of metal carbamates on a silanized kieselguhr surface. The elements adsorbed on this support are later eluted from the column with appropriate reagents.

In the present study the preconcentration techniques for Cd, Cu, Pb and Zn by chelex-100 (a cationic resin) and by the adsorption of metal carbamates on a silanized kieselguhr surface (reverse phase chromatography) were investigated. The concentrated fractions were subjected to measurement by an atomic absorption spectrophotometer. Some analytical results of the sea water samples collected from the east coast of the Thai Gulf were reported.