CHAPTER I
INTRODUCTION

Nowadays, many petrochemical industries are growing up very fast. In petrochemical process, large amount of water has to be consumed and also discharged as an industrial waste. The pollutants in wastewater mostly consist of aromatic hydrocarbons. These chemicals give rise to great environmental concerns because they are either known or suspected carcinogens and mutagens (Jing-Liang Li and Bing-Heng Chen, 2003). Phenol and p-cresol are general pollutants of great environmental concern from industrial effluents. Phenol is important in the production of artificial resins, and in the synthesis of drugs, weed killers, and insecticides. P-cresol is useful as a raw material for various chemical products and disinfectants, and can be used in the production of phenol-formaldehyde resins and converted tricresyl phosphate which is a plasticizer and gasoline additive and to di-*tert*-butylcresol which is an antioxidant.

There are several techniques to separate undesirable contaminants from the wastewater, such as distillation and liquid-liquid extraction; however, these certain techniques still have some shortcoming. Distillation consumes very high energy while liquid-liquid extraction uses many kinds of solvent that might be toxic. A novel class of separation process known as surfactant-based separations is introduced because of their environmental friendly. Recently, Cloud Point Extraction (CPE), which is one of surfactant-based separation techniques, has become more and more attractive because it consumes relatively low energy. Furthermore, the use of relatively benign nonionic surfactant as a mass-separating agent in CPE process can also avoid toxic.

The cloud point phenomenon occurs when the micellar solution of nonionic surfactant is heated until the surfactant property changes from water-soluble to oil-soluble. Above a certain temperature, which is known as the cloud point, the micellar solution of nonionic surfactant will lose its water solubility almost completely and, hence, the surfactant molecules will be separated from the aqueous phase. As a result, the clear solution becomes turbid and phase separation occurs.

Above the cloud point, homogeneous surfactant solution separates into two phases. One phase which is generally less in volume and contains much of surfactant micelle is known as the micellar-rich phase or coacervate phase. The other phase contains less of surfactant micelle is known as the micellar-dilute phase. The organic pollutants in wastewater can be solubilized in the surfactant micelles; therefore, these compounds stay in the coacervate phase and the dilute phase that remains only trace amounts of organic solute can be released to the environment after the extraction occurs. There are many factors that affect the cloud point of a nonionic surfactant, such as molecular structure of surfactant, operating temperature, concentration of surfactant and solute, type and structure of solute, as well as the additives, such as electrolytes.

This thesis focuses on the Cloud Point Extraction (CPE) technique to remove organic compounds *e.g.* phenol and *p*-cresol from wastewater by using the homologous series of alcohol ethoxylate (AE) as a nonionic surfactant. The purpose of this work is to study the effect of molecular structure of surfactant on the extraction efficiency. Moreover, the variations of operating temperature, electrolyte, and the hydrophobicity of solute are also investigated.