CHAPTER I
INTRODUCTION

As an agricultural country, agricultural products account for the bulk of Thailand's foreign exchange earnings and are produced in such large quantities that the country ranks as the world's number one supplier in many commodities. Agriculture has also provided the springboard for the rapid development of argo-processing industries with their favorable bias towards labor-intensive production and foreign exchange earnings. In order to increase agricultural productivity, chemical fertilizers have been considered as a vital factor in agricultural production. However, most of chemical fertilizers being used are still imported. Thus, the government has encouraged and supported the development of the domestic fertilizer production sector. However, this effort has been constrained by the lack of raw materials. Although chemical fertilizers have brought great benefits to agriculture, they have also brought a number of problems, which are tending to become more serious over the years. For example, overuse of fertilizers brings the pollution problem, higher cost, and contamination of both crops and water resources with nitrates and other residues. In addition, many chemical fertilizers are improperly used, and some are in a less effective form.

There are many researches that aim to improve/develop agriculture processes, especially for chemical fertilizers. One of the most recent potential technologies is the controlled release of fertilizers using adsorbents having high cation selectivity, cation exchange capacity, and ion adsorption such as zeolite. Among many species of zeolites, clinoptilolite is an abundant natural zeolite found in igneous, sedimentary, and metamorphic deposits. Because of its high affinity for NH_4^+, clinoptilolite has been used for minimizing environmental pollution, air and water treatment, odor controlling, and animal waste treatment. Consequently, its ability to desorb the adsorbed NH_4^+ ions over a period of time edges its potential to be used for controlled release applications of fertilizers. The important feature of the promising adsorbent for this kind of applications is that it must be able to trap large amounts of NH_4^+ and/or other fertilizer components and release them slowly when applied to soil. While possessing the relevant properties mentioned above, clinoptilolite also has the

advantages of low cost and high tolerance to changing temperatures and chemical conditions

The goal of this study was to investigate the selective adsorption of the fertilizer components by clinoptilolite for controlled release applications in agricultural industry. NH_4^+ and K^+ were used as model plant nutrients in the batch liquid adsorption studies both in single- and mixed-solute systems. Subsequently, the release of both nutrients from preloaded clinoptilolite was investigated.