CHAPTER I
INTRODUCTION

An ion exchange process is an efficient process that has established itself as a technique for various unit applications. An application that can hit close to home is in the treatment of water for drinking. The ion exchange process can soften the water and even be used in desalination. Preparation of various acids, bases, salts, and solutions is also aided with the ion exchange process. Analytical chemistry applies the process principle in chromatography. The recovery of valuable metals is also made possible with the process. In the medical world, there are dozens of important manifestations from the exchange process, from development and preparation of key drugs and antibiotics to prevent coagulation in blood stores and in dextrose.

Although many factors affect the efficiency of the ion exchange process, for a given particular system, three important factors are the size of the ion exchange resins, the pH value, and temperature. Smaller particles usually are more effective for the process because of their high surface area, but they cause large head losses that drive up the pump equipment and energy costs. On the other hand, the pH value directly affects the number of ions available for the exchange process and temperature governs the kinetics of the process.

Although the single ion adsorption in an ion-exchange process has been fully understood, not much has been done for the multi-ion adsorption. It is important to understand totally the multi-ion adsorption because that is what happens in most ion-exchange applications.

Therefore, the main objective of this work is to investigate competitive adsorption of two ions, simultaneously, on Dowex50-8x resins.

Calcium and magnesium ions are chosen for this study. In addition, a model will be proposed that can explain behaviors of the adsorption both in batch and continuous operations.