CHAPTER I
INTRODUCTION

Ion separation can be considered as an essential process for product synthesis, pollution control, and purification. Ion exchange resin has been used for such separation process by using a reversible chemical reaction between a solid (ion exchanger) and a fluid containing various types of ions. Ion exchange resin is known as a synthetic polymer containing active functional groups such as sulfonic, carboxylic, phenolic, or amino group, that give the resin specific property on interaction with ion. Though ion exchange resin is widely used for over three decades, the ultra high selectivity of a specific ion is still the major goal of many researchers. Owing to the understanding of the molecular recognition, the host-guest compound has received much attention as a material for separation processes, including ion separation, as can be seen in the cases of calixarenes, cyclodextrin, and crown ether.

Recently, Ishida *et al.* proposed polybenzoxazine as a class of phenolic materials which shows unique properties such as, no requirement of catalyst in synthesis step, no by-product formation during curing reaction, excellent molecular design flexibility, and superb balance of mechanical and thermal properties. Moreover, it is expected that polybenzoxazines are expected to show the property of inclusion compound owing to its specific structure which is similar to that of calixarenes. Chirachanchai *et al.* have originally studied the benzoxazine oligomer and monomer to explore the inclusion phenomena and demonstrated the potential ion recognition property for various types of metal ions.

This work is an initial step to study the practical application of benzoxazine derivatives as an ion extraction material. The uniqueness of the study is the preparation of benzoxazin-functional silane and coupling onto a high surface area silica to obtain benzoxazine-functional silica powder. The study of an ion extraction model is achieved by using the resin as a stationary phase in the chromatographic separation for alkali and alkaline-earth cations.