CHAPTER I
INTRODUCTION

Supramolecular chemistry has been described as "chemistry beyond the molecule" (Lehn, 2007) where annotated secondary interactions (noncovalent interaction) play a role in the conformation, assembly, or behavior of a system. Supramolecular polymers can also be defined as a polymeric system which extends further the molecules and holds together with noncovalent interactions to form a specific conformation, assembly, and morphology. In addition, the field of supramolecular polymers includes a wide range of current research interests from the assembly of polymers to block copolymer.

As the technologies in the instrumentations have been much progressed for the past decades, the functions of supramolecules relating to chemical structures, molecular shapes and its consequent interactions at nano-level can be well explained. The research on supramolecules to be challenged at the present time is, thus, about how to design novel molecules under specific requirements about supramolecular structures in terms of molecular assembly shapes, sizes, and properties.

For the past few years, our group has focused on *N,N*-bis(2-hydroxyalkylbenzyl)alkylamine since its adventages of simple preparation, easy purification and giving high yield (80-90%) (Laobuthee *et al.*, 2001, 2003; Phongtamrug *et al.*, 2004, 2005, 2006). These derivatives were obtained by a single ring opening reaction of benzoxazine derivatives with phenol compounds. Considering the structure of these derivatives, the single crystallography analysis pointed out the unique inter- and intramolecular hydrogen bonds network to provide asymmetric compounds (Laobuthee *et al.*, 2001). We also extended to the supramolecular chemistry of *N,N*-bis(2-hydroxyalkylbenzyl)alkylamine to declare that these derivatives performed as the host molecules to accept various guest species such as alkali, alkaline earth, and transition metal ions (Laobuthee *et al.*, 2003; Phongtamrug *et al.*, 2004). The information obtained from crystal structure analysis revealed that the host-guest interaction was stable under charge-transfer coordination (Phongtamrug *et al.*, 2006).

The present work is another challenge to study on the supramolecular chemistry of diamine-linked benzoxazine dimer. Here, two types of diamine-linked benzoxazine dimers and their performances in being host molecules are focused. As diamine-linked benzoxazine dimer is under a chelate structure which both hydrogen bond network and metal ion incorporation can be possible, it is our goal to demonstrate the supramolecular polymer system. The work covers the molecular design and synthesis, structural characterization, and the studies to prove the hydrogen-bond supramolecular polymer and metallo-supramolecular polymer.