



## CHAPTER I

### INTRODUCTION

Composite materials are complex materials that combining with two or more distinct structurally complementary substance which produces structural or functional properties not present in any individual component. Generally, it was used in such diverse areas as electronics, construction, packaging and transportation. Composite materials are usually combined with matrix materials and reinforce materials or inorganic material, which have various size and length scale. These particles size is directly affected to some properties of material such as mechanical property and barrier property. Because of size and length scale of component phase, nanocomposite can optimize some properties and thus nanoscale dispersion of inorganic component in polymer matrix become more interest.

Polymer matrix nanocomposites are a relatively new class of materials with ultrafine phase dimensions typically in nanometer size. One of the successes of nanoscale dispersion can be achieved by in situ polymerization of metal alkoxides in organic polymer matrices. However, it has some kind of inorganic material, which can be broken down into nanoscale with well dispersion in polymer matrix. This is used as an alternative method to achieve nanocomposite. It's clays that have many groups, which categorized with their structure and layer charge. Smectite clay, the most popular one, becomes to interest and is used with various types of thermoplastic and thermosetting matrices.

Smectite clay was categorized as the general family of 2:1 layered silicate. In general, isomorphous substitution within the layers generates negative charges that are counterbalanced with cation between

their layers. Usually, these cations are present in hydrate form and allow to exchange with organic cations that improved organophilic property for wetting with the polymer matrix. The aim of work is the preparation of good delamination of silicate layer in the polymer matrix, i.e. polybenzoxazine.

The polybenzoxazine is a thermosetting plastic that is a kind of phenolic resin. It was used for many applications such as electrical circuit board because of its good heat-resistant, flame-retardant, and dielectric properties. This work concerns the synthesis and characterization of well-dispersed layered silicate-polybenzoxazine nanocomposite, with more emphasis on the delamination of organically modified clay to mix with a liquid organic monomer.