CHAPTER I
INTRODUCTION

In the last decade, a recent class of solid porous materials known as porous clay heterostructures (PCH) have been synthesized (Galarneau *et al.*, 1995). Porous clay heterostructures (PCH) shown promising acidic properties for catalytic organic conversions. These porous materials, which are obtained by combining the pillaring and templating approaches, are formed by the surfactant-directed assembly of mesostructured silica within the two-dimensional galleries of a 2:1 mica-type layer silicate, such as fluorohectorite, vermiculite, and montmorillonite (Polverejan *et al.*, 2000). In the product solids, part of the pore walls are clay layers. The PCH afford uniform pore sizes in the supermicro to small mesopore region (1.2-3.0 nm), with high specific surface areas and high thermal stability (Pires *et al.*, 2004). The advantages of this approach are that the pore volume is controlled by the volume fraction of the template constituents, and pore size is controlled by the size of the surfactant micelles (Zhu *et al.*, 2002).

Nanoclay have more attracted than other nano-reinforcement because of their low cost, their ready availability and their non-isometric structure derived from a high aspect ratio, which can maximize the reinforcing effect (Ton-That *et al.*, 2004). Strong interfacial interactions between the dispersed clay layers and the polymer matrix lead to enhance mechanical, thermal and barrier properties of the virgin polymer (Meneghetti, P. and Qutubuddin, S., 2006).

The essential starting clay mineral for the preparation of nanocomposites is from the smectite group, such as montmorillonite (MMT). It is a 2:1 phyllosilicate, which has layered and crytalline structure. In this clay mineral the silicate layers are joined through relatively weak dipolar and Van der Waals forces and the cations Na^+ and Ca^{2+} located in the interlayers or gallery (Arau´jo *et al.*, 2004).

Recently, Nanocomposite technology paves the way for packaging innovation in the flexible film industries, offering enhance properties such as greater barrier protection, increased shelf life and lighter–weight material. From this point of view, one of the goals of this work is to modify the PCH derived from bentonite clay for the mesopores in the clay and study the effect of molar ratio of dodecylamine/TEOS to the pore characteristic and then study components in clay, especially Fe ions (Fe^{2+} and Fe^{3+}), and add the ferric chloride hexahydrate to PCH for inducing the magnetic properties in food packaging. Subsequently, these as–synthesized mesoporous materials were blended with polylactide, and the properties concerning the capability of polylactide–magnetic PCHs nanocomposites in food packaging and magnetic sensor were investigated.