CHAPTER I
INTRODUCTION

Nowadays, many coatings on surface of substrates are available for biomedical and drug delivery applications. The coatings establish an environmentally friendly technology that may enhance the surface quality, stability, safety, and the mechanical handling properties by providing a barrier to moisture and gas between the substrates and the surrounding atmosphere.

The development of the coatings loaded with the natural molecule, addition of drugs and macromolecules such as active protein, enzymes, nucleic acid, or natural compounds to use as a carrier of antioxidants, color agents, flavor agents and antimicrobial is a technological challenge for the industry and a very active research field worldwide. But, the most of natural molecules such as hydrophobic drugs are non-soluble in water and it hard to be immobilized directly on surface of substrates, so, it can be restrained into the polyelectrolyte multilayers (PEM) thin films.

The layer-by-layer (LbL) technique has become the good method to provide nanostructured coating on the surface of solid-supported substrates achieved in a straightforward, low cost manner, easily process and preformed under mild conditions, which is suitable for preserving the activity of biomolecules. The adsorption in LbL coating is governed by electrostatic interactions between opposite charge species. In this study, the PEM have several advantages for example the control of the thickness and composition on the nanoscale, control loading and release affected by factors such as temperature, pH, ionic strength, different type of PEM, salt concentration, salt type, solvent quality, deposition time and polymer concentration (Dubas *et al.*, 1999).

The objective of this work is to fabricate PEM thin films coating on solid-support substrates, obtained by LbL technique, assembled directly on the surface of substrates with alternative layers of synthetic polymer cationic poly(diallydimethylammonium chloride) (PDADMAC) and anionic poly(sodium 4-styrene-sulfonate) (PSS), and natural polymer cationic chitosan and anionic alginate, then improve the loading of 1,7-bis-(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-2,5-dione (curcumin) which is a natural essential oils (EOs) into PEM. Moreover,

studied the effect of parameters such as types of polyelectrolyte, loading temperature, loading time, solvent composition, type of solvent and salt concentration to produce PEM thin films with high amount of loading molecules. The second goal is to improve the properties of PEM thin film for loaded with hydrophobic molecules to increase the final amount of hydrophobic molecules loaded into PEM by surfactants modification.