CHAPTER I
INTRODUCTION

Electrically conductive polymers have been vigorously investigated over the last two decades. The development of research on these polymers has been growing due to their outstanding properties and wide applications. Conducting polymers have been utilized in many fields, such as biological technologies, electronic devices, batteries, and sensors. Today, protection of the environment and persons is more important than before. For that reason there is a need for improved or new sensors for measuring both physical and chemical changes. Nowadays, there is a great interest in making conducting polymer sensors. Several organic materials have been shown to exhibit resistivity changes when exposed to a variety of gases (Selampinar *et al.*, 1995).

Among the numerous electrically conductive polymers, polypyrrole (PPy) has often been studied due to its high conductivity, good chemical and environmental stability and ease of preparation. Conducting PPy can be obtained in various forms, like films or powders. They can also be produced by several techniques, including chemical polymerization and electrochemical polymerization; however, limitations of PPy in their properties, such as weak mechanical properties and poor thermal stability have to be improved in order to achieve satisfactory applications. One of the most efficient methods applied to conducting PPy is to prepare PPy-based composite films into new chemical components, such as nanoparticles of metal oxides, metals, and clay minerals (Biswas *et al.*, 1998).

Nanocomposites, comprised of clay and some polymers, have been extensively studied in order to develop materials with outstanding mechanical as well as optical, electrical, and chemical properties. It has been shown that most of the properties of nanocomposites are enhanced in the presence of a small amount of clay. The most commonly used clay is montmorillonite (MMT) because of its nano-thickness sheet allowing intercalation properties (Kim *et al.*, 2001).

In this work, attempts were made to prepare octadecylamine modified clay (OC-MMT), polypyrrole and its nanocomposites by an oxidation polymerization process (following Ramelow's procedure) [Ramelow *et al.*, 2001], in the presence of organically modified clay with and without doping agent, dodecylbenzenesulfonic acid sodium salt (DBSA). Compared with electrosynthesis, chemical polymerization has an advantage in large-scale production and cost economy, therefore, oxidative polymerization was preferred. Characteristics of the prepared nanocomposites were elucidated by x-ray diffraction, thermogravimetric analysis, FT-IR, and conductivity measurement in the presence of CO_2, CH_4 and C_2H_4 gases.