CHAPTER I
INTRODUCTION

Dielectric elastomers are used in actuator materials system that can be generated large deformation by transforming electrical energy directly into mechanical work. They belong to group of so called electroactive polymer (EAPs) (Wissler, M., 2004). Electroactive polymer (EAPs) offer promising and novel character: lightweight, high energy density and high flexibility; they are material candidates for muscle-like actuators. The poly(acrylate) and styrenics elastomer are widely used in many industrial applications such as computer parts, footwear, inner automobile parts and etc. From different chemical structures, mechanical properties and electrical resistivity of two elastomers types leading to giving the difference of mechanical response under electric fields Thus in this work we interested to comparing various elastomers in term of electrorheology properties for finding the most responsible elatomer under electric fields for actuator application.

Recently, conductive polymers have been studied extensively because of they are quite unique as a possible substitute for metallic conductors and semiconductors due to several advantages such as lightweight, inexpensive and potentially processible nature. Conductive polymers are a new class of organic materials. There are many methods for synthesizing polymers that can be converted into conductive polymers; for example, chemical polymerization, electrochemical polymerization, plasma polymerization, and etc. (Chandrasekhar, 1999). Conductive polymers have been attracting many significant interests, in particular, poly(aromatic) based conducting polymers such as polythiophene, polypyrrole, polyaniline, poly(p-phenylene) and poly(phenylene vinylene) (Küçükyavuz , 2002).

Polypyrrole (Ppy) is one of the most studied conductive polymers because of its good electrical conductivity, good environment stability and intrinsic property of this CPs. But, it is still difficult to obtain this material in a suitable form for applications in various technological fields. One has to overcome certain limitations like poor mechanical properties and processability. One of the best ways to improve these properties is to prepare a composite consisting of a conducting polymer with an insulating one (Güliz Çakmak, 2003). Example are the PET/Ppy

composite for sound shielding (Kim, M.S., 2002), Carbon fiber was reinforced with polydimethyl siloxane (PDMS)/polypyrrole (Ppy) for using as flexible fiber wire (Çakmak, G. 2004), and poly(p-phenylenes)-silicone elastomer for actuators application. (Shiga, T., 1993) thus the incorporation of a conductive polymer into the best dielectric elastomer were interested for proving the hypothesis of conductive polymer can further increase the electrorheology response of this blends.

In our work, we concentrated in various neat elastomer and polypyrrole/elastomer blends as candidates for artificial muscles or actuators. The mechanical properties, electrical properties, and electrorheology properties are investigate in term of electric fields strength, elastomer types, and polypyrrole particle concentration.