CHAPTER I
INTRODUCTION

Drug release is the process of introducing a drug into the body at the appropriate part of the body, during a desired period and for a specific amount. It is imperative that the drug concentration in the blood be maintained at a level that provides maximum therapeutic benefit. There are three main categories of controlled-release drug delivery systems: intravenous, transdermal, and oral systems. The oral route is generally not preferred due to poor absorption, drug degradation, and bioavailability. Thus transdermal drug delivery is an especially attractive alternative, because it is usually easy to apply, safe, and painless.

A hydrogel is a crosslinked polymer network that is insoluble in water but holding a large amount of water in its interspaces of the network. Some hydrogels can change volume, volume phase transition, in response to minute environmental stimuli, such as solvent, temperature, pH, ionic concentration, electric field, and light irradiation [1]. Hydrogel networks formed from poly(acrylic acid) (PAA) have the ability to absorb many times their weight in water and are the basis of a class of materials called super absorbents. These polymers are used in many applications including diapers and personal hygiene products, ion exchange resins, membranes for hemodialysis and ultrafiltration, and controlled release devices [2]. Moreover PAA is widely used in pharmaceutical since its pH dependent swelling behavior. The applications of PAA in pharmaceutical are used in sustained release of drugs in ocular, nasal, buccal, gastro-intestinal, epidermal and transdermal drug delivery. PAA becomes ionized above its pK_a value (4.7). The ethylene glycol dimethacrylate (EGDMA) is generally used as a cross-linking agent.

Conductive polymer is composed of conjugated polymer chain with π-electrons delocalized along the backbone contribute to electrical conductivity. Because of the special properties, it is used in a controlled drug delivery system. Polypyrrole (PPy) is one of conductive polymers which have received great attention since it exhibits high electron conductivity, good environmental stability, easy to synthesis, and it processes excellent thermal and electron properties. PPy is normally

polymerized by either an electrochemical or chemical method [3]. PPy that is synthesized either chemically or electrochemically is insoluble and infusible due to the strong inter- and intra-molecular interactions and cross-linking [4]. Thereby the insoluble nature of PPy has limited its applications. The incorporation of a large-sized protonic acid as a dopant into the polymer reduces the inter- and intra-molecular interactions, so the solubility is increased. From this reason, blend films of conductive polymer and hydrogel have been utilized and investigated in the controlled drug release.

In this work, polypyrrole/poly(acrylic acid) blend film is prepared by the chemical synthesis using 5-sulfosalicylic acid, non-steroidal anti-inflammatory drugs (NSAIDs), as a model anion drug. The electrical properties, morphology, swelling, diffusion and drug releasing rates will be investigated and reported.