CHAPTER I
INTRODUCTION

Transdermal drug delivery systems are an alternative route to transport various drugs into a human body. They avoid the first-pass metabolism and can control the drug levels in blood as occurring in conventional drug delivery systems. Transdermal patches are designed to control the release of active drug dispersed in a polymer matrix over a period of time after adhering onto the skin (Bhowmik *et al.*, 2010).

Thailand is one of large exporters of natural rubber latex obtained from *Hevea brasiliensis*. The latex majority includes *cis*-1, 4-polyisoprene along with interesting properties. There is biocompatibility, high mechanical resistance, capability to form a film, and it is a natural stimulant of angiogenesis. Presently, instead of importing processed products from the natural rubber, the Thai government has been supporting the domestic manufacturings such as tires, gloves, and medical gloves. Moreover, natural rubber latexes can also be used as transdermal patches, for example, the controlled release rate of metronidazole (Herculano *et al.*, 2010), and the blending natural rubber with hydroxypropylmethyl cellulose for nicotine matrix films (Pichayakorn *et al.*, 2012). There are many crosslinking methods which can enhance the mechanical properties of natural rubber. One of these is the UV curing system which uses a short time and low temperature (Choi *et al.*, 2006). The properties of the fabricate-blended films were investigated physical appearances, mechanical properties, moisture uptake, swelling ratio, and their compatibility.

Conductive polymer is one of materials with highly π-electrons delocalized along the backbone associated with electrical conductivity. Polycarbazole is one of many conductive polymers. It possesses unique electrical, electrochemical, and optical properties (Morin *et al.*, 2005). Polycarbazole is usually synthesized by either an electrochemical or chemical polymerization. However, the chemical method is used in this work because of the possibility of bulk synthesis and morphology control (Gupta and Prakash, 2010).

In transdermal drug delivery systems, there is a skin outermost layer, the stratum corneum, which limits the diffusion of macromolecules and hydrophilic drugs through the skin. One of the methods used to promote drug delivery via the skin is the electrically assisted method (Prausnitz and Langer, 2008). Thus, the blends of a conductive polymer and a natural rubber are an attractive alternative as the drug matrix system.

In this work, polycarbazole/natural rubber blend films are prepared by the UV irradiation using trimethylolpropane tris(3-mercaptopropionate) as the crosslinking agent. The objective of this work is to investigate properties of the blended films namely electrical and mechanical properties, thermal behavior, morphology, swelling, and drug release characteristics under the effects of degree of crosslinking and electric field strength.