CHAPTER I
INTRODUCTION

Transdermal drug delivery system is effectively an alternative system to deliver various drug molecules into systemic blood circulation via the skin (Barry, 2001; Ghafourian *et al.*, 2010). Electrical potential is used to create aqueous pathways across the stratum corneum (SC) by short high-voltage pulses applied on the skin, resulting in a high transient permeabilization of SC. Hence, electrical potential could improve and control the amount of drug permeation (Niamlang and Sirivat, 2009). This has raised wide interests because of its high performance and low skin toxicity (Prausnitz *et al.*, 1999; Vanbever and Preat, 1999; Denet *et al.*, 2004). Furthermore, the transdermal patch has been shown to improve the characteristics of the drug permeation (Gondaliya and Pundarikakshudu, 2003), cellulose acetate (Rao and Diwan, 1997), alginate hydrogel (Paradee and Sirivat, 2014), and natural rubber (Thorngkham *et al.*, 2015).

Natural rubber latex (NR, cis-1,4-polyisoprene) extracted from *Hevea brasiliensis* has been widely used as a raw material in the manufacturing of gloves, condoms, balloons, and other medical and dental devices (Herculano *et al.*, 2011). NR has many interesting characteristics, such as ease of manipulation, low cost, natural angiogenesis, biocompatible material, excellent elasticity and flexibility, and ease for film forming (Sruanganurak *et al.*, 2006). In the recent years, NR is also used to be the matrices of transdermal patches. For example, the natural rubber was used in the nitric oxide release using natural rubber latex as a matrix, in the metronidazole release using natural rubber latex as a matrix (Herculano *et al.*, 2011) and in the nicotine transdermal patches prepared from deproteinized natural rubber latex blends (Suksaeree *et al.*, 2012).

There are many ways to prepare a NR film such as chemical vulcanization and radiation vulcanization. Radiation vulcanization of natural rubber latex offers several advantages over the conventional thermo-chemical method, such as low cytotoxicity, higher transparency, and softness, via residual chemicals like nitrosamines, sulphur, and zinc oxide, (Makuuchi *et al.*, 1990). Ultraviolet radiation curing (UV-curing) is a widely established method of industrial importance and

academic interest, due to the combined attributes of rapid, energy efficient curing at ambient temperature on exposure to radiation, and the possibility of achieving formulations free of volatile organic components (Phinyocheep and Duangthong, 2000).

In this work, natural rubber latex and deproteinized natural rubber was fabricated as the matrix for drug delivery application to study the effects of plasticizers and electrical potential. UV radiation method was used to crosslink the rubber matrix. Indomethacin was used as an anionic model drug. The condition of amount of plasticizer, and types of plasticizer were investigated for drug permeation. The effect of electrical potential (0-9 V) on drug permeation is investigated.