CHAPTER I
INTRODUCTION

Thin-film coating on solid substrate has been a popular research topic because it has many applications in composite materials (Luna-Xavier *et al.*, 2002), health care products (Pongprayoon *et al.*, 2004) and microelectronic devices. Moreover, they can provide many beneficial physical and chemical properties, such as improvement in adhesion between polymer matrix and reinforcing filler in composite materials, increase in composite strength, reduction of cure time, increase in tear strength, improvement of elongation at break and improvement of process property (Bunsomsit *et al.*, 2002. and Rungruang *et al.*, 2006).

The new method has been used to produce thin-film coating on solid substrate by using surfactant is called admicellar polymerization or the thin-film via surfactant template (TFST). This technique has been improved over last several years. The film thickness is in a range of nanometers to tens of nanometers. The process has been characterized as occurring in four steps, 1) surfactant adsorption 2) monomer adsolubilization 3) polymerization and 4) surfactant removal. This method has been used to form a polymer film on various substrates such as alumina (Wu *et al.*, 1987.), calcium carbonate (Rungruang *et al.*, 2006.), cotton (Pongprayoon *et al.*, 2002.), glass fiber (Sakhalkar *et al.*, 1995.), natural rubber (Bunsomsit *et al.*, 2002.), rice straw fiber (Zhao *et al.*, 2011.) and silica (Waddell *et al.*, 1995.).

In previous studies, admicellar polymerization had been used to improve the adhesion between a filler substrate (usually amorphous precipitated silica) and polymer matrix by modifying the substrate surface with an ultra-thin polymer film (Kawahara *et al.*, 2003). The differences in the properties between unmodified silica and rubber can cause poor dispersion of the silica, resulting in poor physical properties. Additionally, rubber compounds are incapable of strongly adhearing to an unmodified silica surface. To improve the compatibility of silica in rubber as well as the adhesion of rubber to the silica, ultra-thin films of organic polymer can be formed on the silica surface (Waddell *et al.*, 1995). In many previous studies, homo-polymer and co-polymer were chosen and then the results were reported on the rubber testing properties such as tear strength, abrasion resistance, and tensile properties (O'Haver

et al., 1996. and Thammathadanukul *et al.*, 1996.). The adsorption isotherm of surfactant has been studied for admicellar polymerization. Cetyl trimethylammonium bromide (CTAB) and sodium dodecyl sulfate (SDS) were used to form surfactant bilayers on the NR surface and acted as a reaction template for admicellar polymerization (Bunsomsit *et al.*, 2002 and Magaraphan *et al.*, 2009).

Scope of this work is to study surfactant bilayer adsorption by varying the concentration of 4 different types of surfactant; CPC (cationic surfactant), DBSA (anionic surfactant), C7BzO (zwitterionic surfactant) and NP30 (nonionic surfactant) adsorb on the surface of the substrate (natural rubber latex particles, NR) and varying the substrate concentration (5, 10 and 20 w/v% of NR) and pH of the solution on adsorption isotherm. After that, the admicellar polymerization of the PMPS film coated on NR was studied. The following work is to investigate properties of the film such as morphology and thermal properties. The aim of this work is to investigate the suitable condition for surfactant bilayer adsorption on NR that appropriated to use in admicellar polymerization on NR.