

CHAPTER I

INTRODUCTION

Thin-film coatings on solid substrate have been a popular research topic because they have many applications in composite materials, health care products 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.

The new method 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 range of nanometers to tens of nanometers. The process has been characterized as occurring in four step, 1) surfactant adsorption, 2) monomer adsorption, 3) polymerization and 4) surfactant removal.

In previous studies, admicellar polymerization has been used to improve the adhesion between a filler substrate (usually amorphous precipitated silica) and polymer matrix (natural, butyl and SBR rubber compounds) by modifying the substrate surface with an ultra-thin polymer film. 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 adhering 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. 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 Thammathanukul *et.al.*, 1996).

In this research, scope of work is to study polystyrene coated on natural rubber by admicellar polymerization technique by using two different of surfactants (SDS and CTAB) and varying condition of reaction such as the effect of styrene monomer concentration, initiator and the effect of salt concentration on adsorption

isotherm. After admicellar polymerization, the following work is to analyze and characterize the film coated on natural rubber particles. This research focuses on the influence of styrene content on the morphology, influence of initiator content and salt condition on the molecular weight, mechanical properties, thermal properties, resistance to environment and analyzes properties of blended sample between modified natural rubber and pure polystyrene. The aim of work is improve process properties of natural rubber because natural rubber is an inexpensive material and an important agricultural product of Thailand. The mechanical properties of the product from this research may be comparable to the mechanical properties of high impact polystyrene (HIPS) for use in several application. It may be able to replace HIPS by having lower investment cost. Furthermore, the control of tacticity of synthesize polystyrene molecules is also expected.