CHAPTER I
INTRODUCTION

Fillers are often added to rubber to improve performance in commercial applications. There are many types of fillers used in the rubber industry. Carbon black is the most widely used as reinforcing filler for rubber, providing excellent reinforcement at a relatively low cost but, unfortunately, the only available color is black. Reinforcing silica is generally more expensive than carbon black of equivalent particle size but silica produces highly reinforced compound with neutral color (Wagner, 1976). Silicas can also provide additional property benefits and compounding flexibility that is not obtainable with carbon blacks.

Commercially produced silicas are the highest reinforcing non-black filler, but they lack of one prerequisite for full rubber reinforcing capability, i.e. strong silica-rubber bonding. Unmodified silica cannot form chemical bonds with elastomers. The porous structure of silica can adsorb accelerators, leading to deactivate vulcanization. Moreover, acidity of silica surface can retard cure time. These effects lead to poor compatibility between the silica and rubber. For these reasons, methods to improve the silica surface by modification of the silica surface are of considerable interest.

Several methods such as bifunctional organosilanes, grafting, and *in situ* polymerization are available for the modification (Chinpan, 1996). Silicas modified by the *in situ* polymerization of organic monomers significantly increases rebound resilience and offers greater overall improvements in rubber compound performance than that modified by the silane coupling agent method. In addition, the organo-silanes process is much more expensive (Thammathadanukul, 1995).

Previously, admicellar polymerization has been successfully performed only in batch systems, which usually do not provide the consistent product needed for industrial applications. The objective of the present research was to develop modified silicas by *in situ* polymerization (admicellar polymerization) of organic monomers in the surfactant layer adsorbed onto the surface of precipitated silicas in order to enhance silica/elastomer interactions leading to improving performance of rubber products. Additionally, a systematic study of the effects of co-monomer loading and retention time on the modified silicas were examined.