CHAPTER I
INTRODUCTION

Fillers are finely divides solids added to a rubber compound to improve properties or reduce cost of the vulcanisate. Fillers are divided into two types which are reinforcing and non-reinforcing fillers. Carbon black and silica are reinforcing. Calcium carbonate and clay are non-reinforcing.

Clay is one of the nonblack fillers for the rubber industry. Its performance is due to its low comparative cost, versatility, and stiffening properties even through classified in the non-reinforcing group fillers. Strictly speaking, "clay" refers to a physical condition, not a chemical composition, but old habits die hard. Kaolin clay, the type of clay used in rubber, has been derived from the weathering of aluminous minerals such as mica and feldspar. The closet approach to its chemical composition would probably be $Al_2O_3.2SiO_2.2H_2O$.

An important recent development in rubber clay technology was the introduction by J.M. Huber Company of clays chemically modified by the use of silanes with amino or mercapto pendant groups. The silane is chemically bonded to the kaolin silicate sheet by the hydrolyzed silane group and pendant amino or mercapto group can then crosslink with the elastomer. The result is a rubber with improved reinforcement, as indicated by higher modulus, tensile strength, and tear resistance. However, organo-silanes are very expensive, thus significantly increasing the cost of production.

The present study focuses on the modification of clay by a process based on *in situ polymerization* of organic monomers solubilized in surfactant layers adsorbed onto the surface of clay. It has proven successful in improving rubber

compound physical properties when used to modified silicas as fillers(Waddell et. al., 1995 and O'Haver, 1995). The method used for the modification of inorganic powders by the formation of ultra-thin polymer films in adsorbed surfactant bilayers, call admicelle, has been investigated since the mid 1980s. This process has been studied on a variety of inorganic substrate using various types of monomers, surfactants and initiators and has been applied to a variety of industrially important substrates. The process consists of four basic steps: (1) adsorption, (2) adsolubilization, (3) polymerization, and (4) washing or surfactant removal.

This research studies the reinforcement of a model natural rubber compound by using the *in-situ* polymerization on clay which is the non-reinforcing fillers and reduced cost fillers.