CHAPTER 1

INTRODUCTION

Poly(vinyl chloride)(PVC), one of the few synthetic polymers that has a wide range of application in commerce, has a sales volume between polyethylene and polystyrene. By the year 2000, the Stanford Research Institute predicts that, in the United States, PVC will be the leader with an annual volume of 17×10^9 metric tons [1]. This widespread use arises from a high degree of chemical resistance and a truly unique ability to be mixed with additives to give a large number of reproducible PVC compounds with a wider range of physical, chemical, and biological properties than any other plastic material. Thus, with the help of properly chosen additives, a PVC formulation can be used as wire insulation, rigid pipe, footwear or house siding. It is this unsurpassed versatility that has given PVC its great utility.

However, PVC compounds lack of elastic property which has in rubber such as acrylonitrile-butadiene rubber(NBR). Consequently, the elastic properties of PVC compounds can be adjusted by incorporation of a rubber-component into the plastic matrix. In contrast, thermoplastic can improve the reprocessed properties in rubber which had passed the vulcanization process already. Thus, conventional vulcanized rubber or thermoset rubber can be reprocessed several times when mixed with thermoplastic.

Thermoplastic elastomers (TPE) mentioned above are the material that combine properties between thermoplastic and elastomer(or rubber) to take advantages of both. A major change is taking place in the rubber and plastics industries in the United States and throughout the world. This change is the enormously commercial growth of the use of TPE. From a modest beginning in the late 1950's, TPE have become a significant factor in the industrial rubber products industry. These materials have captured approximately 8 % of this entire industry. TPE are projected to grow at a cumulative rate of 8 % to 9 % per year for the next decade, in contrast to the projected growth rate of less than 2 % for the conventional thermoset rubber industry and 2 % to 4 % for the plastics industry as a whole. Thus, TPE are projected to have a growth rate of two to five times more than the rubber and plastics industry as a whole [2].

This growth will likely come primarily from the replacement of conventional thermoset rubbers and conventional thermoplastics, and from new uses requiring materials with rubber-like properties. Sometime during the early to mid 1990's, TPE usage is expected to approach or exceed the "magic" 1 billion lbs/year level in the United States, Western Europe, the Far East, and other parts of the world are also seeing similar rapid growth rates.

The market opportunity for TPE as replacements for conventional thermoset rubber articles is very large. The potential for industrial rubber products market for TPE is 9 billion lbs worldwide.(The tire segment offers little opportunity to the various TPE currently in the market place.) Consequently, the industrial

rubber products area has already experienced significant growth in the use of TPE.

The objective of this work is to study the physical properties of PVC and nitrile rubber blends at various compositions. The effects of fillers, calcium carbonate, carbon black and silica, on the properties of PVC and nitrile rubber blends are investigated. The physical properties of the polymer blends are also the useful informations for footwear applications.