CHAPTER I

INTRODUCTION

Recently, the major problem in the application of plastic in engineering is their low stiffness and strength when compared to metal and wood in a case of heating. A method used to offset these deficiencies is the addition of reinforcing particles or fibers into the plastic to form a composite material. At present plastics have substituted these materials and increased many more roles to daily life.

1.1 The Roles of Composite Materials

It is generally accepted that glass fiber reinforced plastics (GRP) are the most common composites used as engineering materials. The importance of fiber-filled composites arises largely from the fact that such materials can gave unusually high strength and stiffness for a given weight of material. The specific strength (tensile strength/density) and the specific modulus (modulus/density) can surpass the values for even the best of the metals. When polymer composites are compared to unfilled polymers, the improvements they offer are spectacular. Composites incorporating glass or other relatively low modulus fibers (less than about $12x10^6$ psi) are used in many high-volume applications such as automotive and transportation because of their low cost, low weight, corrosion resistance. The growing use of composites materials of United States of America is shown in Fig.1.1.

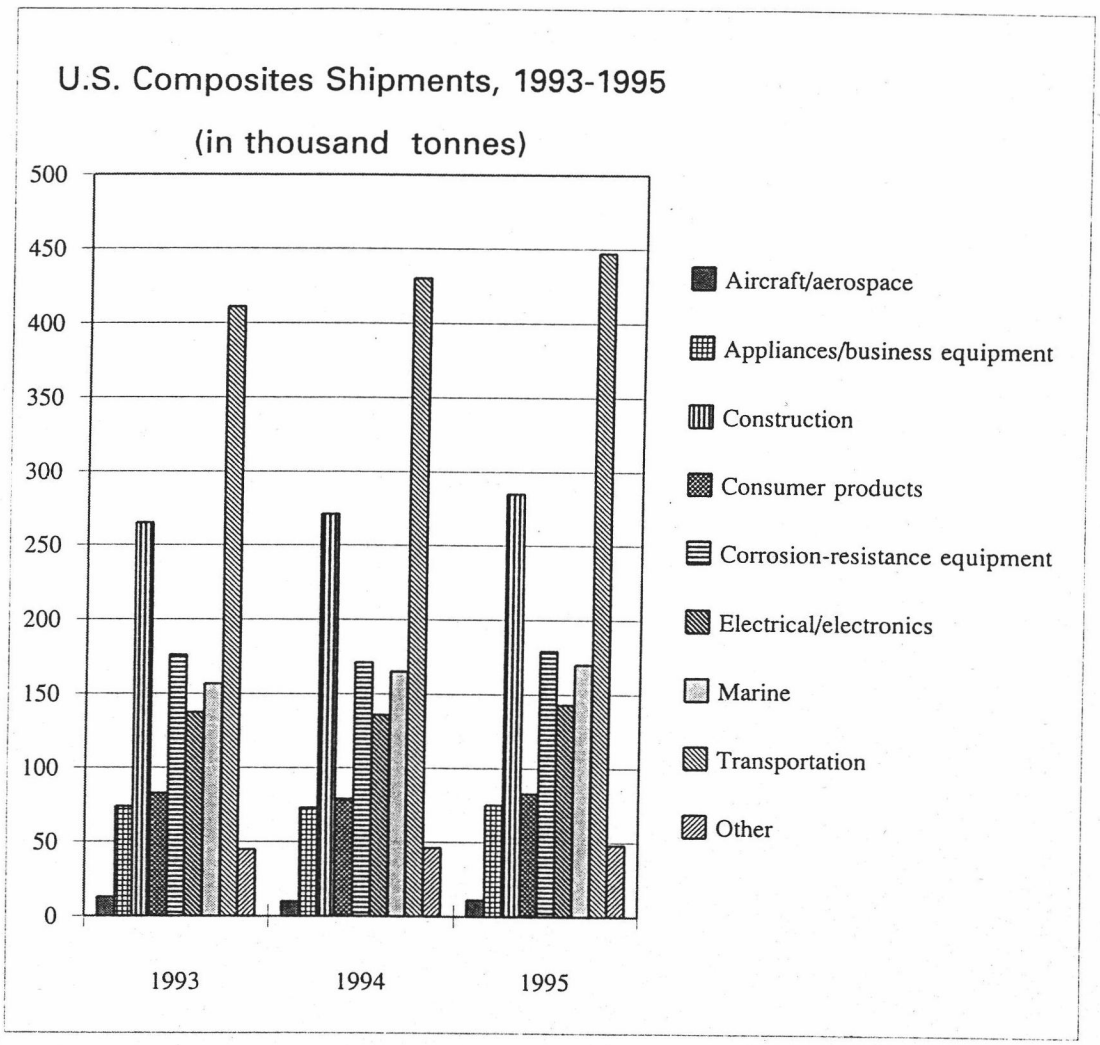

Figure 1.1 The growing use of U.S. composites shipments in 1993-1995 [1].

Due to high potential applications, fabrication industry of GRP is one of the rapidly growing industries. Many attempts play a great role to boost many new products or new applications. At present, many techniques are continuously developed to produce various GRP products for hitting the market and one of the most interesting developments in recent years is concerned with thermoplastic-glass fiber. Current applications for this includes automotives, electronic machine housings, door and window parts, valves, and other construction application[2].

1.2 Purpose of the Research Work

Advantages of composite materials are light weight, corrosion resistance, high strength, flexibility in design and raw material saving. At present these materials include reinforced thermoset and thermoplastic composites. For the advantages of thermoplastic composites are scrap recovery, product recyclability, low price of raw material, and tougher then most of the thermosets.

Compounding of thermoplastic blend could be performed by using two roll mill machine. Thermoplastic composites is easily fabricated by using compression molding techniques. The purpose of the experimental work is to improve the compatibility and the mechanical properties of glass fiber reinforced PVC/SAN composites

1.3 Objectives of the Research Work

1. To prepare glass fiber reinforced poly(vinyl chloride) / styrene acrylonitrile copolymer composites by using two roll mill and compression molding techniques
2. To study the effects of PVC/SAN blend compositions, glass fiber content and concentrations of silane coupling agents on the mechanical properties of PVC/SAN composites

1.4 Scope of the Research Work

The glass fiber reinforced PVC/SAN composites were prepared by a two roll mill machine and pressing through a compression molding machine at various PVC/SAN blend compositions, concentrations of both silane coupling agents and

distortion temperature, thermal analysis, and microstructure were investigated. This research work was done as follows:

1. Literature survey of the past research works
2. Preparation of rigid PVC blend and glass fiber treated with silane coupling agent.
3. Blending PVC, SAN and glass fiber in a two roll mill and fabrication of composite sheets in a hydraulic compression machine by changing the following parameters:
    a) PVC/SAN ratio, 60/40, 70/30, and 80/20
    b) glass fiber content, 10, 20 and 30 % by weight
    c) concentration of silane coupling agents
4. Determination of the following mechanical and thermal properties:
    - tensile strength
    - tensile modulus
    - elongation at break
    - flexural strength
    - flexural modulus
    - hardness
    - heat distortion temperature
    - thermal analysis
5. Determination of resin, fiber and void content by measuring the density of polymer blends and composites
6. Studying the microstructure of the fracture surface of composites by scanning electron microscopy
7. Summarizing the results.