

## CHAPTER I

### INTRODUCTION

#### 1.1 General

Plastics have lots of advantages over metal; being light and strong, neither rusting nor growing mold, excellent electrical and heat conductivity, color and shape are flexible, mass production with even quality, i.e., good processability. So, plastic parts for electric equipment; such as circuit box, blower or internal parts, are preferable to use instead of metal parts. It is hard to deny that plastic is now becoming more important, especially for the engineering plastic (1).

Engineering plastics are those high performance plastics which are suitable for structural applications, machine parts and components, used primarily for industrial purposes, with high heat resistance (2). Normal properties of engineering plastics are high heat resistance (over  $100^{\circ}\text{C}$ ), high tensile strength (over  $500 \text{ kgf/cm}^2$ ) and high flexural modulus (over  $24,000 \text{ kgf/cm}^2$ ). Besides they are good resistant to environmental conditions, i.e., chemicals, heat and weather, and show excellent durability, good electrical property, non-combustible, self-extinguishing property, good processability and dimensional stability (3).

Most of engineering plastics used in Thailand are imported which make them expensive, while commodity plastics can be produced in Thailand and it is 3 to 4 times cheaper than engineering plastics. The commodity plastics like

high impact polystyrene (HIPS) which is derived from copolymerization of styrene monomer and butadiene shows potential to replace those engineering plastics. It has lots of special qualifications; good electrical property, heat conductivity, color mixability, water-unabsorbed ability and good processability. However, they have some weakness in deterioration under heat, susceptibility to stain by staining agents, such as oil, grease or fatty acids (4), poor solvent resistance, low strength and rigidity, limited dimensional accuracy. Additionally, its creep and stress relaxation are lower than the engineering plastics. The improvement of these physical properties of high impact polystyrene can be performed by fiber reinforcement, which will enable to hold more weight and friction. To reinforce properly, coupling agent is needed to function as a bonding phase at the interface between high impact polystyrene resins and reinforced fiber. The popular coupling agent widely used in industry is silane compound (5).

### 1.2 Objectives of the Research Work

To improve physical properties of high impact polystyrene resin comparable to some engineering plastics.

### 1.3 Scope of the Research Work

Composites were prepared by mixing HIPS and silane coupling agent by thumber mixer and pelletized.

Blending compound and glass fiber are reinforced manually. Finally, these mixtures were injection molded to produce the standard ASTM specimens by injection machine. In this research work, different levels of

chopped and milled fiber loading, starting from 5% to 15% (weight by weight) and different levels of silane coupling agent starting from 0.1-0.4 phr were studied. The high impact polystyrene (HIPS) with glass fiber and ABS glass fiber were injected to produce blowers in air-conditioner and compared the properties.