



CHAPTER I

INTRODUCTION

Uncontrolled fire is a danger in life and property. A prime cause the fire hazard is the use of natural and synthetic flammable materials in buildings and vehicles. Materials, semifinished and finished components are put to use in many ways as furnishing and as integral part of building such as coverings of walls and ceiling, roofing and piping, wire and insulation. Use of such materials in vehicles include seat, upholstery and other automotive parts. Different applications have different fire hazards, which although they cannot be eliminated altogether can be reduced to an acceptable level. Recent statistics clearly indicate that smoke inhalation, and not fire itself, is the killer that accounts for over 80% of fire fatalities.

The use of polymer materials in daily life and in industry is closely connected with the problem of fire safety. This is the reason why manufacturers and consumers pay serious attention to the flammability properties of polymer materials. Hence, current research in fire safety places great emphasis on the design of products that have low flame spread properties and low smoke producing.

Flame retardants are chemical substances that are added in a plastic compound to reduce combustibility of a polymer. They operate by decomposing when exposed to heat levels below the level sufficient to ignite the compound. The decomposition of the flame retardant reduces the ignitability of the compound and lower its rate of burning.

Polypropylene, a thermoplastic which remains the fastest growing major thermoplastic in the worldwide production, finds further applications in automotive part, battery case, electrical equipment, wire and cable insulation. The fire hazards of polypropylene is concern about the emission of large amounts of smoke and toxic gases ; carbon monoxide, hydrogen chloride from the combustion of burning polypropylene. There is considerable interest in developing novel flame retardants for use in these polymer.

In general, the main additives, which are in current usage as flame retardant for polypropylene, are halogenated flame retardant synergist with antimony trioxide, but these compounds poses such problem as toxicity of flame retardants, corrosion during molding and emission of smoke and toxic fumes in molding.[8] Because of these disadvantage, there has been considerable interest in finding the new and safer additives as flame and smoke retardant in polypropylene.

In 1980, inorganic tin compounds were found to be effective flame retardant in a number of natural and synthetic polymers.[2] They appear to have certain advantages over the existing commercial additives, namely :

- Non-toxicity.
- Effectiveness at low incorporation levels.
- No discoloration of substrate.
- Marked flame retardant synergism with halogen.
- Little apparent effect on physical properties.
- Combine flame retardancy and smoke suppressancy.
- Wide range of applicability.

In view of these factors, it was suggested that the possible use of tin compounds as flame retardant. In addition, studies at International Tin Research Institute (I.T.R.I.) have demonstrated the effectiveness of zinc stannate [ZnSnO] and zinc hydroxystannate [ZnSn(OH)], as flame retardant additives for halogen containing polymer formulations.

Therefore, this study was concentrated on the possible use of tin compounds as flame retardants in polypropylene, by comparing effectiveness of flame retardancy to commercial additives including the effect of flame retardant additives on physical properties. Further, the mechanism of retardation will also be observed.