



CHAPTER I INTRODUCTION

Nanocomposites represent a current trend in novel nanostructured materials. In general, composites form two or more physically and chemically distinct phases (usually polymer matrix and reinforcing element), and properties of the resulting product differ from and are superior to those of the individual components. The structures and properties of the composite materials are greatly influenced by morphologies and interfacial properties of the component. Nanocomposites are based on the same principle and are formed when phase mixing occurs at a nanometer dimensional scale. They can be defined as a combination of two or more phases containing different compositions or structures, where at least one of the phases is in the nanoscale regime (1-100nm) that contains relatively small amounts (<10%) of nanometer-sized particles. As a result, nanocomposites show superior properties over their micro counterparts or conventionally filled polymers.

Polymer layered silicates (PLS) are the most common group of nanocomposites. Owing to their nanometer size dispersions, nanocomposites are hybrid organic polymer-inorganic materials with unique properties when compared with conventional filled polymers. The main advantages are lightweight, high modulus and strength, decrease in gas permeability, and increase in solvent resistance. Because of the length scale involved that minimizes scattering, nanocomposites are usually transparent. They also exhibit significant increase in thermal stability as well as a self-extinguishing character.

Organosilicon and aluminum compounds are members of the broader class of “organoelement compounds”, the polymers of which combine the thermal stability of inorganic materials with the elasticity and solubility of organic polymers (Akhmetov, 1983). Today organosilicon and aluminum polymers are used in applications ranging from answers to synthetic problems in health care products, computer chips, electronic components, liquid crystalline polymers and dirt-resistant polymers for carpets to advanced ceramics for aerospace and electronic components (Voorhoeve, 1967).

Flame retardant additives are used to meet fire safety requirements for plastics and other flammable materials. They prevent fires from occurring or if one does break out, limit its spread. Together with other fire prevention, flame-retardants ensure a high safety standard and protect human life, health and property. Nanocomposites constitute a new development in the area of flame retardancy and offer significant advantages over conventional formulations where high loading is often required. In addition to environmental questions, the primary criteria involve fire safety, quality and cost effectiveness of the products. Because they do not release smoke and toxic or corrosive gases generated by flame-retardant additives, mostly plastic halogen flame retardant and polyvinyl chloride. Thus, improvements of flame retardancy of commodity plastics that risk to combust i.e. Nylon and PVC with PLS become interesting.

Nylon (polyamide) is an engineering resin, which is widely used for making thermoplastic molding materials and fabric applications i.e. curtain, carpet, net, container etc. PVC (polyvinyl chloride) is a commodity plastic being one of the most important plastics with large volume consumption. It is used for making pipes, tubes, cladding window and door frames and thermal insulation. This work would attempt to prepare PLS mixed with polymer via melt intercalation process because it is more convenient to process and obtain finishing products with good flame retardant property than in-situ polymerization and solvent intercalation processes.