SYNOPSIS

Nowadays, Polymers are playing a vital role in almost all branches of industry. The exploitation of the properties offered by new polymeric materials by recent advance in technology leads to increasingly diverse uses to be found for established polymers. There are two general important characteristics that have contributed for the great success of these new polymeric materials. Firstly, their relatively high resistance to chemical, atmospheric and biological attack, which confers obvious advantages. Secondly, the comparative ease with which the physical properties of these materials can be varied by imposed chemical or environmental changes during manufacture. Versatility is an essentially direct consequence of the large size and of the associated geometrical possibility latent in the polymer molecules.

With the advancement of civilization, man is looking for new materials to meet his specific needs. The new material should provide better properties and the preparation method should be available at affordable cost. Polymer scientists succeeded in generating many polymer blends, co-polymers and polymer composites to meet some of these demands. Polymer blends are the mixtures of structurally different homo-polymers, co-polymers, ter-polymers and the like, which interact through secondary forces with no covalent bonding. The blending of polymers may result in the reduction of basic cost, enhancement of performance and improved processability.

The manifestation of superior properties of polymer blends depend on the miscibility of homo-polymers at the molecular scale. Since solid state techniques like electron microscopy, calorimetry, differential mechanical analysis, optical microscopy etc. are expensive, complicated, time consuming and cannot be used for routine analysis, we have employed solution techniques such as viscosity, ultrasonic velocity, density and refractive index methods for the miscibility studies of some water soluble Polymer blends in solution.
The present thesis is divided into eight chapters as follows:

CHAPTER 1

This chapter gives a brief introduction about the polymeric materials and the miscibility of polymer blends, objective and scope of the present work are highlighted in this chapter. Also, it presents the detailed review of literature survey about the solid as well as solution techniques to study the miscibility of polymer blends.

CHAPTER 2

This chapter describes a brief introduction, classification, properties and rheological behaviour of water – soluble polymers. Also, in this chapter, experimental techniques and procedures about the solution techniques like viscosity, density, ultrasonic velocity and refractive index measurements on the miscibility of polymer blends are discussed in detail.

CHAPTER 3

This chapter reports the miscibility studies of sodium alginate /polyvinyl alcohol blend in water at different temperatures by viscosity, density, ultrasonic velocity and refractive index methods. Chemistry of sodium alginate and polyvinyl alcohol are described in brief. The molecular weight of sodium alginate was determined by the method of gel permeation chromatography. Semi-compatible nature of sodium alginate(SA) /polyvinyl alcohol (PVA) blend in water at 30 °C, 40 °C and 50 °C is established by reduced viscosity measurement studies. These results were compared with density, ultrasonic velocity and refractive index studies. Effect of temperature on the miscibility of the blend system by viscosity, density, ultrasonic velocity and refractive index methods are carried out. The temperature effect is so marginal on the SA/PVA blend.
CHAPTER 4

Viscometric, density, ultrasonic and refractive index studies on the miscibility of Sodium Alginate (SA) / Polyvinyl Pyrrolidone (PVP) and Sodium Alginate (SA)/Polyethylene Glycol (PEG) blends in solution at 30 °C and 50 °C are reported in this chapter. A brief description about the chemistry of polyvinyl pyrrolidone and polyethylene glycol are given. Reduced viscosity measurement studies indicate that both the blends are semi-compatible in nature. Ultrasonic velocity, density and refractive index measurement studies are carried out to support the reduced viscosity measurement studies. The temperature has no effect on the miscibility of both the blends.

CHAPTER 5

This chapter reports the compatibility studies on Sodium Alginate (SA)/Starch and Sodium Alginate (SA)/Hydroxypropyl Methylcellulose (HPMC) blends at 30 °C and 50 °C by viscometric, density, ultrasonic velocity and refractive index techniques. The chemistry of starch and hydroxypropyl methylcellulose are discussed in brief. Reduced viscosity, density, ultrasonic velocity and refractive index measurement studies are carried out. These studies establishes the compatible nature of SA/Starch and semi-compatible nature of SA/HPMC blends. Effect of temperature on the reduced viscosity, ultrasonic velocity, refractive index measurements are also carried out. But the temperature has no effect on the miscibility of both the blends.

CHAPTER 6

Viscometric, density, ultrasonic velocity and refractive index studies on the miscibility of Methylcellulose (MC) /Polyvinyl Pyrrolidone (PVP) and Methylcellulose(MC)/Polyethylene Glycol (PEG) blends in solution at 30 °C and 35 °C are carried out. A brief description on the chemistry of methylcellulose is given. These techniques have explored the possibility of miscibility windows and
thereby semi-compatible nature of both the blend systems. Effect of temperature on the miscibility of both the blends are also studied.

CHAPTER 7

This chapter discusses the miscibility of Polyacrylamide(PAAm)/Polyethylene Glycol - 6000 (PEG-6000) and Polyacrylamide(PAAm)/Polyethylene Glycol - 4000(PEG-4000) blends in water at 30 °C by viscometric, density, ultrasonic velocity and refractive index techniques. The chemistry of polyacrylamide is discussed briefly. It is established that both the blends are non-compatible in nature.

CHAPTER 8

This chapter discusses the low basic cost of pilot plant for the development of new polymer blends and advantages of the solution techniques like viscosity, density, ultrasonic velocity and refractive index in order to study the polymer – polymer miscibility. A brief conclusions on all the chapters from 1 – 8 are also given. Finally, scope for further study based on these chapters is also discussed.