ABSTRACT

The ultrasonics has been extensively applied to study the properties of polymer solutions. The Rao constant, adiabatic compressibility and solvation number evaluated from ultrasonic velocity and density measurements have been used to elucidate the structure and nature of molecular interactions in aqueous and non-aqueous solutions of polymers. Ultrasonics has also been used to determine the compatibility of polymer-polymer blends in recent years.

The Rao formalism has been found applicable in polymer solutions but no systematic study has been undertaken to investigate the effect of solvent power and molecular weight of polymer on Rao formalism for polymer solutions. The effect of solvent power on Rao formalism has been observed by finding out the Rao constants of poly(methyl methacrylate) in good solvents as well as in theta solvent over wide range of concentrations and temperatures. It is evident that the Nomoto equation holds good for dilute polymer solutions in good solvent at all temperature and in theta solvent above the theta temperature. It does not hold good for polymer solution in theta solvent below the theta temperature where shrinkage of polymer coils and aggregation of polymers take place. The applicability of Rao formalism is better in polymer solutions having strong

polymer-solvent interaction and no aggregation or association. The effect of molecular weight of polymers on Rao formalism has also been studied and it is found that Rao constant of polymer solution is totally invariant with the molecular weight of the polymers.

In the present investigation, an attempt has been made to study the effect of molecular weight on solvation comprehensively which is affected by intra and intermolecular interactions of polymers and polymer-solvent interaction. It is observed that in the solvation of a polymer, effects of both polarity and normal mode relaxation are acting simultaneously. The solvation number is found to be independent of molecular weight if there is weak interaction between solvent and polymer but dependent on molecular weight where there is appreciable polymer-solvent interaction.

A number of interacting blends in aqueous solutions have also been studied by ultrasonic, rheological and viscometric techniques. The mixing of the solutions of different polymers produces an immediate precipitate or turbidity or homogeneity indicating respectively stronger, weaker and no interaction between the polymers. Extensive investigations of the above studies over wide range of concentrations, temperatures, compositions, pH and shear rates indicate the degree of miscibility, extent of interaction between the polymers and stoichiometry of the polymer complex formed by the strong interaction between the polymers in solution.