MAR09-2008-000502

Abstract for an Invited Paper for the MAR09 Meeting of the American Physical Society

## Ion solvation and its effects on the miscibility of binary polymer blends

ZHEN-GANG WANG, Division of Chemistry and Chemical Engineering, California Institute of Technology

We study the effects of adding salt ions on the miscibility of a binary blend of polymers having different dielectric constants. The competition between the preference of the ions to be solvated by the component of the higher dielectric constant and the entropic tendency for the ions to be distributed uniformly results in non-trivial effects on the miscibility. We first study the thermodynamics of the polymer blend-ion mixture using a simple Born model in a uniform dielectric medium of the average composition of the polymer blend. We then study the effect of local enrichment of the higher dielectric constant polymer near the ion. We find that when the dielectric constants of the polymers are both low, adding salt decreases the miscibility, while when the dielectric constant polymer and a low dielectric constant polymer, miscibility is decreased if the low dielectric constant component is the majority and is increased if the high dielectric constant component is the majority. The effect becomes significant at ion concentrations corresponding to an order of one ion per polymer chain. The quantitative change in the effective  $\chi$  parameter depends on the functional form of the composition dependence of the dielectric constant of the mixture. We also illustrate the difference between fixed ion concentration and fixed chemical potential of the ions.