Inverse Gas Chromatography Studies of Polymer-Solvent Systems with High Pressure Carrier Gases

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The solubility and diffusivity of gases at elevated pressures are important in numerous polymer processing and formation operations such as polymerization reactors, removal of photo resist, and foam production. To alleviate health and environmental concerns high pressure carbon dioxide is being used in a number of applications to replace conventional solvents or to enhance the removal of residual solvents and monomers. This presentation considers the influence of high pressure gases on the solubility and diffusion behavior of solvents in polymers. Inverse gas chromatography is recognized as an effective method of determining the partition coefficient and diffusion coefficient of a solvent in a polymer at near ambient pressures. The effects of plasticizing the polymer with a second solvent has been studied by increasing the pressure of the carrier gas within the capillary column. The results indicate that gases such as carbon dioxide and ethylene, even at relatively low pressures, can have a significant effect on the polymer-solvent interactions.