396d Probing Thermodynamic Effects in Polymer-Solvent Systems by Low and High-Pressure Inverse Gas Chromatography

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The capillary column inverse gas chromatography (CCIGC) technique has been applied from ambient pressure to ~1100 psia to measure partition and diffusion coefficients in ternary systems containing polyvinyl acetate (PVAc). The ambient pressure experiments examined the effect of water and methanol on the thermodynamic interactions between toluene and PVAc. Toluene interactions with PVAc were unaffected by the presence of methanol but were greatly suppressed in the presence of water.

A newly developed high-pressure CCIGC capability was benchmarked with the binary system vinyl acetate monomer (VAM) and PVAc, using an inert gas, i.e., helium, as the high-pressure carrier gas by comparing the data measured with traditional low-pressure CCIGC measurements. Variable temperature, high-pressure CCIGC experiments were subsequently performed with VAM using carbon dioxide and ethylene as the carrier gases. The VAM-PVAc partition coefficients were found to decrease appreciably in the presence of CO2 and ethylene while the diffusion coefficients exhibited a marked increase in VAM diffusion rates.