Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Use of light scattering data to determine free energies of ternary mixtures GEORGE THURSTON, DAVID ROSS, CARL LUTZER, Rochester Institute of Technology, SETH FRADEN, Brandeis University — We demonstrate a method that uses light scattering data to determine the free energy of ternary liquid mixtures, through solving a second-order nonlinear partial differential equation appropriate for single isotropic phases. We show that forward light scattering efficiency data, together with boundary condition data, permit integration of the second derivative of the intensive free energy along curves tangent to the local dielectric coefficient gradient vector. With suitable information about phase boundaries the method also accommodates the presence of phase-separated regions next to single-phase regions in which the governing equation is an appropriate model. In the presence of composition-dependent optical dielectric dispersion, light scattering at more than one wavelength can help augment and check such free energy determination. In summary, light scattering provides a non-invasive method of determining ternary liquid mixture free energies without adopting specific free energy models in advance.

George Thurston
Rochester Institute of Technology

Date submitted: 20 Nov 2006 Electronic form version 1.4