Inferring mixture Gibbs free energies from static light scattering data[1] DAVID ROSS, Rochester Institute of Technology, CHRISTOPHER WAHLE, University of Findlay, GEORGE THURSTON, Rochester Institute of Technology — We describe a light scattering partial differential equation for the free energy of mixing that applies to connected, isotropic ternary and quaternary liquid composition domains, including restricted domains which may not touch all binary axes. For restricted domains, contrasting light scattering efficiency patterns obtained at different wavelengths can correspond to the same underlying free energy, and supplement the available information. We discuss well-posed problems for this fully nonlinear, degenerate elliptic partial differential equation. Using Monte Carlo simulations, we provide estimates of the overall system measurement time and sample spacing needed to determine the free energy to a desired degree of accuracy, and indicate how measurement time depends on instrument throughput. These methods provide a way to use static light scattering to measure, directly, mixing free energies of many systems that contain liquid domains.

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