Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Discrete combinatorial phase mapping of multicomponent mixtures** JOAO CABRAL, ALAMGIR KARIM, Polymers Division, NIST — We report an experimental investigation of the bulk phase behavior of multicomponent mixtures using a novel discrete combinatorial approach. The technique involves a parallel cloud point detection scheme using discrete composition libraries, which are scanned across a temperature range and optically imaged. Sample substrates are microwell arrays fabricated by contact photolithography on a glass coverslip. Polymer blend libraries are generated using a custom built, programmable liquid dispenser system. The sample arrays are placed in a uniform, but continuously varying, temperature field, scanning the mixture across its phase boundary. Optical turbidity is detected by imaging the entire array and the cloud point curve is determined through automated parallel image analysis. In this demonstration, we investigate mixtures of low molecular mass poly(styrene) and poly(butadiene), exhibiting upper critical solution temperature (UCST) phase behavior. The cloud point curves obtained closely approximate the bulk binodal line, and have a high composition resolution of delta phi = 0.01 (volume fraction), using 10 x 10 sample arrays. We discuss thermodynamic and kinetic effects induced by the addition of copolymers and nanoparticles.

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Date submitted: 30 Nov 2004 Electronic form version 1.4