## Abstract (English)

This thesis presents a study and analysis of the material properties and phase behavior of liquid-in-liquid systems. Both pure liquids and solutions containing solutes such as drug, salt, oil, protein and antibody have been investigated. Chapter 2 presents a thorough description of the micropipette manipulation technique used as the primary experimental method throughout this thesis. Chapter 3 presents the theory associated with liquid microdroplet dissolution and some of the considerations that have been taken into account when applying the Epstein-Plesset model. Diffusion coefficients of octanol-in-water, $D = 7.2 \pm 0.5 \times 10^{-6}\, cm^2/_s$, water-in-octanol, $D = 1.96 \pm 0.1 \times 10^{-6}\, cm^2/_s$, water-in-decane, D = 3.3 ± 0.2 x $10^{-5}$ $cm^2/_s$, DCM-in-water, D = 2.0 ± 0.2 x $10^{-5}$ $cm^2/_s$ and Ibp-in-water, D = 5.2 ± 0.7 x $10^{-6}$ $cm^2/_s$, are presented. Chapter 4 focuses on NaCl as a solute and presents a novel triple micropipette technique for supersaturation, 10.3 ± 0.3 M, and saturation, 5.5 ± 0.1 M measurements. It is shown that the extended Epstein-Plesset model successfully predicts diffusion controlled microdroplet growth and that induction time and surrounding medium affects crystal morphology. Chapter 5 presents Triolein parameters in an ethanol-water-lipid system. Solubility, 31 mg/ml in ethanol, diffusion coefficient, $D = 3.7 \pm 0.3 \times 10^{-6}\, cm^2/_s$ in ethanol, and interfacial tension, 31 mN/m vs water and 1 mN/m vs ethanol are presented. Effect on interfacial tension of POPC addition was measured, 1.7 mN/m vs water, and parameters were used to predict the critical nucleation sizes for 'trapped' Triolein nanoparticles, 20 nm. Chapter 6 presents micropipette investigations of protein, sugar and antibody systems as part of a commercial scale-up for protein and antibody microglassification formulation. Final concentrations of bovine serum albumin, 1143 ± 82 mg/ml, and bovine gamma globulin, $1388 \pm 177\, mg/ml$, in the microglassified particles were measured. Bulk preparation of bovine gamma globulin were made and scanning electron microscopy was used to compare the different microparticles.