

Deposition of Small Organic Molecule from Two Immiscible Supercritical Phases (DISP)

김재훈*, Ruben G. Carbonell¹, 김재덕
한국과학기술연구원; ¹North Carolina State University
(jaehoonkim@kist.re.kr*)

A new coating process is described (Deposition from Two Immiscible Supercritical Phases, or DISP) in which a solution of supercritical carbon dioxide (scCO₂) with a desired solute is displaced by supercritical (scHe). Micron sized particles and thin films of sucrose octaacetate (SOA) were deposited on silicon wafer substrate coupons from DISP at relative low temperatures and pressures (≤ 400 bar and ≤ 60 °C). Particle size, film thickness and morphology of SOA were characterized as a function of coating conditions – solution concentrations, withdrawal velocities, and pressures. Particles in the range of 1 – 14 μm in diameter were deposited at low solute concentrations (≤ 0.2 wt% at 300 bar) whereas films in the range of 0.1 – 0.5 μm in thickness were deposited at higher solute concentrations (≥ 1.5 wt% at 300 bar). Particle sizes decreased with increasing displacement velocity and increasing pressure. Optical microscopy and atomic force microscopy (AFM) were used to observe film morphology including defect formations and film roughness. Films deposited from DISP were much thicker, more uniform, and exhibited much fewer drying defects and lower RMS roughness compared with film from the organic solvents.