



CMET SEMINAR

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10:00 a.m.

366 Colburn Lab

abstract

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“Nanoparticle Formation by Flash NanoPrecipitation using Block Copolymer Directed Self-Assembly”

Nanoparticle formulations of drugs, printing inks, sun screens, and other hydrophobic organic compounds have distinct advantages in bioavailability, color intensity, and aesthetics. Common requirements of these applications are control of particle size and surface functionality. We present our new process --Flash NanoPrecipitation -- that produces stable nanoparticles at high concentrations using amphiphilic diblock copolymers to direct self-assembly. Uniform particles with tunable sizes from 50-500 nm can be prepared. The key to the process is the control of time scales for micromixing, polymer self-assembly, and particle nucleation and growth. The diffusion-limited assembly enables particles of complex composition to be formed. Examples of particle formation for controlled delivery of multiple drugs from nanoparticles will be presented, as well as formulations of nanoparticles in micro particles for aerosol drug delivery. A novel strategy for producing nanoparticles from soluble active compounds is demonstrated that enables the simultaneous encapsulation and controlled release of both hydrophobic and hydrophilic actives. The incorporation of gold nanoparticles and organic compounds into single nanoparticles enables simultaneous delivery and medical imaging. Finally, the ability to dry the nanoparticles by lyophilization or spray drying and to reconstitute them without aggregation greatly enhances the applicability of the technology.