

# From Uniform Particles to Homogeneous Films: Latex Film Formation

Authors: Professor William Russel

*Department of Chemical and Biological Engineering, Princeton University, USA*

**wbrussel@princeton.edu**

Drying colloidal dispersions by evaporating the liquid to create particulate solids, porous coatings, or continuous films is common to a number of important technologies, ranging from applying latex paint and manufacturing photographic film to depositing highly porous coatings on ink jet papers and fabricating photonic crystals from silica sols. The objective is generally to create a layer of specified thickness and controlled porosity with permeability, strength, transparency, or other physical properties. The processing raises a number of interesting and difficult issues because of the conflicting constraints and performance properties. Both understanding and implementation of drying processes have advanced considerably in the past two decades.

The focus of this talk is the complex phenomena that emerge as evaporation drives fluid flow in the thin film. Rapid evaporation can segregate binary mixtures or create a dense layer or skin at the surface. Slower evaporation produces a porous packing subject to a rising capillary pressure that deforms the particles either elastically or viscously. The former often leads to cracking and peeling, while the latter produces a pore-free solid.