Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Controlled synthesis and destabilization of gas- or liquid-filled spherical colloidal microshells ANAND BALA SUBRAMANIAM, MANOUK ABKARIAN, CECILE MEJEAN, L. MAHADEVAN, HOWARD STONE, Harvard University — Colloidal particles assembled on gas microbubbles have been shown to dramatically increase the lifetime of gas bubbles. However current approaches to the synthesis of these particle-covered gas bubbles, or similar liquid drops, rely on bulk emulsification methods, which prevents the control of shell composition or size of the bubbles. Furthermore, the opacity of the bulk method prevents the understanding of the dynamics of the shell growth as particles adsorb on the surface. We propose that the energetic barriers to interfacial crystal growth and organization can be overcome by targeted delivery of colloidal particles through hydrodynamic flows. Here we report a microfluidic method that allows direct visualization and understanding of the dynamics of the growth of colloidal shells on curved fluid interfaces. We show that the particles form a well-ordered crystalline shell on the interface, which undergoes an instability to periodically eject stable spherical gas-filled microshells. The particles are essentially jammed on the surface, which influences the mechanical properties of the resulting shell. The jammed shells can be destabilized by exposure to surfactants and we show that dissolution of the gas bubbles resumes.

Anand Bala Subramaniam
Harvard University

Date submitted: 07 Sep 2005

Electronic form version 1.4