

Abstract Submitted  
for the MAR16 Meeting of  
The American Physical Society

**Designing self-assembling 3D structures of microcapsules** LIKE LI, HENRY SHUM, OLEG SHKLYAEV, VICTOR YASHIN, ANNA BALAZS, University of Pittsburgh — Self-assembly of complex, three-dimensional structures is commonly achieved by biological cells but difficult to realize in synthetic systems with micron-scale or larger components. Some previous modeling studies have considered only the planar self-assembly of microcapsules on a substrate. In this work, nanoparticles released from the capsules bind to the substrate and to the shells of nearby capsules. The non-uniform nanoparticle deposition on a capsule’s surface leads to adhesion gradients, which drive the capsules to effectively “climb” on top of one another and self-organize in the vertical direction. We determine conditions that favor this structural organization. In particular, we study how the vertical structuring depends on the background fluid flow, the topography of the microcapsules and the underlying surface, the capsule-capsule interaction and that between the capsules and the substrate. The findings can provide design rules for the autonomous creation of novel nanocomposites, where the layers are formed from nanoparticle-containing and nanoparticle-decorated microcapsules.

Like Li  
Univ of Pittsburgh

Date submitted: 05 Nov 2015

Electronic form version 1.4