Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

A novel release mechanism from responsive microgel capsules[1]
HASSAN MASOUD, ALEXANDER ALEXEEV, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology — We use a mesoscale computational model for responsive gels to study the release of nanoparticles from hollow microcapsules. Our model explicitly describes the transport of nanoparticles in swelling/deswelling polymer networks with complex geometries and associated fluid flows. Our simulations show that capsule swelling results in a steady release of encapsulated nanoparticle, which is set by the ability of particles to diffuse through the capsule network. For deswelling capsules, we show that a fluid flow induced by capsule shrinking leads to rapid nanoparticle release. This release, however, is limited due to decreasing mesh size of the deswelling shell. We show that by introducing solid microrods inside deswelling capsules, we can control the rapid release. Our calculations reveal that the rods stretch the deswelling membrane and promote the formation of large pores in the shell, which allow massive flow-driven release of nanoparticles. Thus, our findings reveal a new approach for regulating the release from stimulus responsive micro-carriers that may be useful for designing new drug delivery systems.

[1]Financial support from the Donors of the PetroleumResearchFund, administered by theACS, is gratefully acknowledged.

Hassan Masoud
Georgia Institute of Technology

Date submitted: 30 Jul 2011 Electronic form version 1.4