

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Uniform colloidal clusters from random aggregation of bidisperse spheres¹ NICHOLAS B. SCHADE, MIRANDA C. HOLMES-CERFON, Harvard University, ELIZABETH R. CHEN, None, DINA ARONZON, JESSE W. COLLINS, JONATHAN A. FAN, VINOTHAN N. MANOHARAN, Harvard University — Using a combination of experiment and simulation, we investigate the structures that form when colloidal spheres cluster around smaller spheres. We use either oppositely charged particles or particles coated with complementary DNA sequences to form the clusters, and we observe them under optical microscopy. We find that random sphere parking serves as a useful model for cluster self-assembly in these systems and that the sphere diameter ratio controls the distribution of cluster sizes. In particular, near a critical diameter ratio, random parking produces tetrahedral clusters in theoretically unlimited yield. Experimentally we observed 90% tetramer yield near this geometrical singularity. We investigate how this method can be used to assemble tetrahedral plasmonic resonators from metallo-dielectric nanospheres in order to create a bulk, isotropic, optical metamaterial.

¹We acknowledge support from NSF grant no. ECCS-0709323 as well as the DOE Office of Science Graduate Fellowship Program.

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Date submitted: 27 Nov 2011

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