Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Highly uniform polyhedral colloids formed by colloidal crystal templating YIFAN WANG, JAMES MCGINLEY, JOHN CROCKER, Univ of Pennsylvania, CROCKER RESEARCH GROUP TEAM — We seek to create polyhedral solid particles by trapping oil droplets in a colloidal crystal, and polymerizing them in situ, resulting in polyhedral particles containing spherical dimples in an ordered arrangement. Specifically, highly monodisperse, micron-sized droplets of 3-methacryloxypropyl trimethoxysilane (TPM) were first prepared through a poly condensation reaction, following well established methods. The droplets were mixed with an excess of polystyrene(PS) particles (diameter in 2.58 μm), which formed close packed (FCC or HCP) colloidal crystals by natural sedimentation and compression under partial drying to an extent, with TPM oil droplets trapped into their tetrahedral and octahedral interstitial sites and wet PS particles. Depending on the initial particle volume fraction and extent of drying, a high yield of dimpled particles having different shapes including tetrahedra and cubes were obtained after oil initiated polymerization and dissolution of the host PS particles, as seen under SEM. The effects of TPM to PS particles size ratio, drying time, and other factors in relation to the yield of tetrahedral and cubic dimpled particles will be presented. Finally, fractionation techniques were used to obtain suspensions of uniform polyhedral particles of high purity.

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Date submitted: 14 Nov 2014 Electronic form version 1.4