Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Diamond Lattice Colloidal Crystals from Binary DNA-grafted Microspheres[1] JOHN CROCKER, YIFAN WANG, IAN JENKINS, JAMES MCGINLEY, TALID SINNO, Univ of Pennsylvania — Future optical materials promise to do for photonics what semiconductors did for electronics, but the challenge has long been in creating the structure they requirea regular, three-dimensional array of transparent microspheres arranged like the atoms in a diamond crystal. Here we demonstrate a simple approach for spontaneously growing double-diamond (or B32) crystals from a binary suspension of sub-micron polymer microspheres with synthetic DNA grafted to their surfaces. While diamond symmetry crystals have previously been grown from much smaller nanoparticles, none of those methods appear workable for the larger particles needed for photonic applications, whose size must be comparable to the wavelength of visible light. Intriguingly, matched simulations fail to nucleate or grow B32 crystals from suspension; nor have they been predicted on the basis of theoretical arguments. We conjecture that the B32 crystals may form via transformation from a precursor with a different lattice structure in the bulk or on its surface. The feasibility of converting our self-assembled crystals into diamond-symmetry photonic templates will be discussed. This finding suggests that still other unexpected microstructures may be accessible using this approach.

[1]US National Science Foundation, CBET- 1403237

John Crocker
Univ of Pennsylvania

Date submitted: 11 Nov 2016 Electronic form version 1.4