Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Experimental observation of photonic bandgaps in two dimensional hyperuniform disordered materials SEYED HASHEMIZAD, WEINING MAN, San Francisco State University, MARIAN FLORESCU, Princeton University, POLIN YADAK, KAZUE MATSUYAMA, San Francisco State University, SALVATORE TORQUATO, PAUL STEINHARDT, Princeton University, PAUL CHAIKIN, New York University — We report the first experimental demonstration of photonic bandgaps (PBGs) in 2D hyperuniform disordered materials and show that is possible to obtain isotropic, disordered, photonic materials of arbitrary size with complete PBGs. There are only limited numbers of allowed rotational symmetries in periodic or quasiperiodic structures. Periodicity and Bragg scattering lead to different stop gap center frequencies in different directions, since periodicities change in different directions. Hyperuniformity together with short range geometric order and uniform local topology are enough to give raise to an isotropic PBG. Hyperuniform systems have a variance in mass or particle number which varies with distance, r, from an arbitrary point less rapidly than the d dimensional volume. We present a new class of photonic materials posessing PBGs that have a number of advantages, including: isotropy, robustness against disorder (they are already disordered), flexibility (can fit arbitrary regions of space in which one may have trouble putting a periodic system), and possibly lower minimum dielectric contrast.

Paul Chaikin
New York Universtiy

Date submitted: 29 Dec 2010 Electronic form version 1.4