Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Experimental investigation of photonic gaps in optical Thue-Morse multilayers fabricated using nanostructured thin films MATTHEW HAWKEYE, University of Alberta, MICHAEL BRETT — One-dimensional Thue-Morse (TM) multilayers are realized by stacking together layers of different refractive index according to simple rules. The result is a deterministically generated aperiodic system representing an intermediate stage between a periodic medium and a random one. This work focuses on the formation of photonic band gap regions at multiple frequencies relating to local positional correlations in the TM structure. TM multilayers are realized in the visible and near-IR spectral regions using glancing angle deposition (GLAD), a single-step nanofabrication technique providing control over the internal columnar structure of a deposited thin film. The effective refractive index of the deposited layer is tuned by controlling the columnar structure leading to great flexibility over the choice of refractive index in the experiment. Using GLAD, TM multilayers are fabricated out of titanium dioxide by varying the density of the columnar structures. The resulting photonic gaps are characterized using transmittance and reflectance spectroscopy and compared with the results of transfer matrix simulations. The creation of gaps in different generations of the TM system will also be examined.

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Date submitted: 27 Nov 2007 Electronic form version 1.4