

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Hierarchical **vol-**
ume gratings by combining holographic-patterning and block copolymer
self-assembly MICHAEL BIRNKRANT, RUSSELL MARRON, CHRISTOPHER
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PA, LALGUDI NATARAJAN, VINCENT TONDIGLIA, TIMOTHY BUNNING,
Materials Manufacturing Directorate, Wright-Patterson Airforce Base, OH — A
novel hierarchical photonic crystal (HPC) was fabricated by combining top-down
and bottom-up nanomanufacturing techniques. The hierarchical structure was fab-
ricated from a volume of material by combining holographic patterning (HP) and
block copolymer (BCP) self assembly. The structure of the HPC was investigated
as a function of the BCP architecture, BCP concentration and crystallization tem-
perature. Upon heating the photonic crystal a red shift in the reflected wavelength
occurs; but, an initial decrease in diffraction efficiency (DE) followed by an increase
in DE indicates a non-monotonic change in the structure of the HPC. Upon cool-
ing the reverse occurs reflecting the dynamic change in the hierarchical structure.
Transmission electron microscopy, in-situ FTIR and optical spectroscopy were used
to correlate the optical property change with BCP/HPC morphology. This approach
could open a gateway to fabricating multifunctional hierarchical nanostructures.

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Date submitted: 28 Nov 2008

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