

## **Nano-Imprinting Photonic Crystals for Optical and Near-IR Applications**

G.Subramania, C.F. Schmidt, W.C. Sweatt, I. El-Kady, F.B. McCormick,  
D.W. Peters, J.C. Verley, J.D. Williams, F.B. McCormick, T.S. Luk  
Sandia National Laboratories, PO Box 5800 MS 1082, Albuquerque, NM USA  
87185

Photonic crystals can serve as an excellent platform to enhance light-matter interaction in addition to providing enormous flexibility in the control of light propagation. However the realization of this technology requires a low cost process capable of generating large areas PBGs that can be patterned with internal defects and waveguides to support optical communication requirements.

Nano-imprint technology provides an inexpensive method for producing large areas of 3-D photonic band gap (PBG) materials for such commercial applications. This technique transfers patterns from a hard material such as silicon, metal, or glass to a soft polymer mold. The process is currently used to produce one square inch of photonic material with band edges between 0.7 and 4.2 microns can be tiled to create large areas of PBG material for commercial applications. These crystals have been fabricated with a variety of materials including silicon, gold and titanium oxide. Micro cavities and waveguides have also been introduced within some of these crystals to demonstrate the future application space for devices. Furthermore, introducing external stimuli such as temperature, liquids, nanoparticles and electro-optic materials allows one to alter the bandgap and/or defect cavity modes.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,  
for the United States Department of Energy's National Nuclear Security Administration  
under contract DE-AC04-94AL85000.