

## **LIGA Fabricated Photonic Crystals for the Mid-IR**

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Exposure of resist using Deep X-ray lithography (DXRL) provides high aspect ratio polymer structures at a variety of incidence angles. The LIGA technique combines DXRL with well established electroplating processes to generate metallic photonic band gap (PBG) materials in either 2 or 3 dimensions. The novelty to this approach is that one can create simple 3-D photonic structures in a single step process that does not require any alignment. The mask and substrate are fixed to one another and exposed multiple times from different angles using a synchrotron light source.

We present 3 different photonic structures fabricated with this technique. The first is a 2-D magnetic photonic crystal comprised of a high susceptibility nickel-iron alloy to evaluate the effects of localized magnetic fields within a photonic crystal. The second is a 3-D tilted woodpile structure consisting of gold rods electroplated into a resist mold using a single layer resist process. [1] These structures represent the [111] orientation of the [100] logpile structures previously demonstrated by Sandia National Laboratories. Reflectivity tests show a band edge around 5  $\mu\text{m}$  and compare well with numerical simulations. The final structure is a 3-D chiral PBG generated by patterning multiple exposures in SU-8 resist and electroplating into the developed pattern. The spiral structures are plated with a high index contrast material and resist stripped to create a PBG with one of the largest band gaps predicted in the literature.

[1] J.D. Williams et. al, Proc. of the SPIE 6289, 62890A1 (2006).

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