Docket #: S11-504

Drive Systems and Optimization Techniques for Photonic Bandgap (PBG) Crystals

A Stanford researcher leverages common wafer manufacturing processes to optimize the performance of photonic bandgap (PBG) crystals for a variety of applications. Overall, the optimization techniques insert an array of useful defects within the basic photonic crystal lattice to achieve a desired shift in the PBG crystal properties. For example, one technique can increase the throughput or bandwidth of the PBG crystal, while another technique changes the pattern of radiative loss (see Figure) and yet another technique eliminates hot spots within the crystal lattice. The real power behind the invention is that it provides a system for tweaking the PBG crystal to make it more tailored for specific applications.

Figure Caption: Photonic bandgap micro-capillary array with a) the uniform field accelerating mode |Ez| in the defect, and b) a diffuse, hexagonal pattern of radiative loss around the vertices and in c) a more directed pattern obtained by eliminating a single capillary at each vertex.

SItage of Research

Analysis of 2D hollow core Photonic Band Gap structures

Applications

- Scanning Electron Microscope (SEM)

- Laser driven Accelerators – 10 to 20 times higher gradient and shorter wavelength over conventional RF systems
- Medical diagnostic – integrated radiation production such as gammas or neutrons on biochips
- Material science
- Oil and gas exploration

Advantages

- Fast optimization of PBG crystal
- Employees well-developed wafer fabrication techniques such as etching, Chemical Vapor Deposition (CVD) or drilling
- Enables integration of independent elements into the overall system
- Lower cost due to higher gradients and more compact designs
- More robust designs

Patents

- Published Application: [20140178022]

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