Broad Wavelength Range Chemically Tunable Block Copolymer  
Technology #12844

Applications

Responsive photonic crystals have applications ranging from active chemical sensing to controlling and processing light for active components of display, sensory, and telecommunication devices.

Problem Addressed

There have been examples of 3D periodic Colloidal Crystal Array Photonic Crystals (CCA PCs) that use mechanical fields, electric fields (Maxwell stress), or 3D isotropic swelling of the hydrogen matrix; however, these mechanisms have only achieved small shifts of the stop band (~100-200nm). This block copolymer lamellar structure allows reversible shifts of the stop band for solvent swelling/deswelling of >1250nm.

Technology

This material platform is a hydrophobic block - hydrophilic polyelectrolyte block copolymer that forms a simple 1D periodic lamellar structure. This results in a responsive PC hat can be tuned via swelling of the hydrophilic layers by contact with a fluid reservoir. The glassy hydrophobic layer forces expansion of the hydrophilic layer along the layer normal, yielding extremely large optical tenability through changes in both layer thickness and index refraction.

Advantages

- Increased reversible optical changes
- Simplified optical toggling via fluid swelling

Categories For This Invention:

Polymers (Materials)  
Other (Photonics)

Intellectual Property:

Broad wavelength range chemically-tunable photonic materials  
Issued US Patent  
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Inventors:  
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Publications:

Tunable Photonic Gels
Nature Materials
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Image Gallery: