

What are hydrogel-based photonic structures?

Hydrogel-based photonic structures may be categorized by the types of photonic structures in which hydrogels are used. To date, typical photonic structures, such as waveguides, optical fibers, PhCs, and plasmonic structures, have been developed based on hydrogels.

Can hydrogels be used for photonic devices?

Moreover, hydrogels possess unique properties that respond to external stimuli, causing them to be promising candidates for designing responsive optical devices for a variety of photonic applications.

Are multifunctional hydrogels suitable for energy storage and conversion?

This is largely due to their exceptional mechanical properties, inherent multifunctionality, and noteworthy biocompatibility. The goal of this review is to provide an in-depth analysis of the recent advancements made in the field of multifunctional hydrogels as applied to energy storage and conversion.

What is hydrogel photonics?

Hydrogel photonics has emerged as a promising solution in the field of active photonics by providing primarily deformable geometric parameters in response to external stimuli. Over the past few years, various studies have been undertaken to attain stimuli-responsive photonic devices with tunable optical properties.

Do hydrogels have tunable optical properties?

Over the past few years, various studies have been undertaken to attain stimuli-responsive photonic devices with tunable optical properties. Herein, we focus on the recent advancements in hydrogel-based photonics and micro/nanofabrication techniques for hydrogels.

Why do we need hydrogel thermoelectric materials?

Given the limited energy utilization efficiency, the enormous amount of waste heat generated from industrial manufacturing not only leads to energy loss but also exacerbates climate change problems. Hydrogel thermoelectric materials show great potential for converting low-grade thermal energy into electrical energy.

Energy bands in photonic crystals. ... Photonic crystals can be used as chemical sensors for sensing the pH and ionic strength of solutions [73]. The authors of [73] made a colloidal crystal array (CCA) or an opal photonic crystal, which strongly diffracts light, using highly charged mono-disperse polystyrene spheres. ... Hydrogels are ...

Conventional photonic devices exhibit static optical properties that are design-dependent, including the material's refractive index and geometrical parameters. However, they still possess ...

Photonic crystals (PCs) show great potential for new sensors, anti-counterfeiting inks, displays, smart glass,

textiles. ... the application of nanoparticles with a hollow sphere structure in energy storage, medicine, and the environment has also attracted attention [79], ... Photonic crystal hydrogels are made by combining photonic crystals ...

Glucose monitoring in polyacrylamide-polyethylene glycol hydrogel designs was achieved through a blue shift in the photonic stopband arising from increased hydrogel crosslinking related to the formation of a supramolecular complex ...

A hybrid hydrogel system composed of CdTe quantum dots and photonic crystals . The composite materials combining quantum dots (QDs) and photonic crystals (PCs) could produce complex and high-dimensional anti-counterfeiting patterns, which solves the problems of simple coding information and a low anti-counterfeiting level of monochromatic materials.

such as photonics, optics and optoelectronics, sensing, solar photovoltaics, energy storage, biomedical engineering, environ-mental remediation, communications, and even quantum computing.² Colloidal PhCs were first formed in the 1990s by self-assembly of spherical polystyrene colloidal particles.³ Almost

Microfluidics-Assisted Assembly of Injectable Photonic Hydrogels toward Reflective Cooling, Small, 2020, 16, 1903939. ... Photonic Crystals towards Robust Energy-Saving Performance, Angewandte Chemie International Edition, 2019, 58, 13556-13564. Hu XH * ...

Self-assembly of colloidal particles into amorphous photonic crystals. Yang Hu? a, Yuqi Zhang? b, Dongpeng Yang * a, Dekun Ma c and Shaoming Huang * a a School of Materials and Energy, School of Physics and Optoelectric ...

Three-dimensional photonic crystals made of close-packed polymethylmethacrylate (PMMA) spheres or air spheres in silica, titania and ceria matrices have been fabricated and characterized using SEM, XRD, Raman spectroscopy and UV-Vis transmittance measurements. ... [25], although the energy difference is small. Valuable ...

In this paper, we review the latest advances in multifunctional hydrogels for energy storage and conversion. The discussion commences with an exploration of the mechanisms, ...

Mechanochromic colloidal photonic crystals (PCs), which typically integrate a self-assembled PC array with a highly elastic medium, exhibit the ability to reversibly respond to external mechanical stimuli by altering the periodicity of PC structures. Nowadays, leveraging visible indications and optical signals for mechanical forces, mechanochromic colloidal PCs ...

Solar energy, as a renewable and sustainable resource, presents a cost-effective alternative to conventional energy sources. However, its intermittent nature necessitates ...

Nevertheless, this strategy enables the development of mechanically safe and deformable Li-ion batteries and could potentially be suitable for other energy storage devices ...

The color of most animals is relatively fixed, but some animals are capable of undergoing rapid, physiological color change which allows them to display different colors and patterns in response ...

Multifunctional polyacrylamide/hydrated salt/MXene phase change hydrogels with high thermal energy storage, photothermal conversion capability and strain sensitivity for personal healthcare. ... In situ formed thermogelable ...

The fundamental characteristic of a PC is the photonic band-gap (PBG), which is a frequency range that forbids the existence of energy states similar to what the periodic potential does to the electrons in atomic crystals (5). In 1912, Bragg studied the relationship between X-ray diffraction and crystal structure, which can be used to predict ...

Bletilla striata is an herb with a good medicinal value whose main active ingredient is Bletilla striata polysaccharide (BSP) in the tuber of Bletilla striata. In this study, a polysaccharide-based semi-interpenetrating network ...

Colloidal crystallization serves as one of the most economic and scalable production methods for photonic crystals. However, insufficient optical performance, nonuniformity and low reproducibility ...

Colloidal photonic crystals (CPCs) are close-packed ordered arrays self-assembled from monodispersed colloid spheres. The self-assembled CPCs have great advantages of low cost, flexibility, and easy processability which show great potential for create captivating and diverse photonic structures for new photonic materials and devices.

The double-network (DN) hydrogels formed by polyacrylamide (PAM) and sodium alginate (SA) were combined with photonic crystals (PhCs) self-assembled from polymethyl methacrylate (PMMA) nanoparticles to monitor the water content of solid-state electrolytes.

We demonstrate azobenzene photochemically driven diffraction switching of a photonic crystal consisting of a crystalline colloidal array (CCA) polymerized within a hydrogel matrix. A novel azobenzene derivative that has a large ground-state activation barrier between the cis and trans forms in water is used. The system is actuated by excitation with UV light ...

It is inevitable that hydrogel is affected by adhesion and diffusion of impurities during the application and storage process. Zhao ... SMPs show potential for applications in biomedical devices, aerospace, textiles, energy, electrical engineering, etc. ... In situ formed thermogelable hydrogel photonic crystals assembled by

thermosensitive ...

A photonic hydrogel for health self-monitoring of solid-state electrolytes in zinc-air batteries Energy Storage Materials (IF 18.9) Pub Date : 2022-09-07, DOI: 10.1016/j.ensm.2022.08.047

Photonic crystals (PCs) with crack-free morphology, high-saturated structural color and sensitivity to circumstances are expanding their applications in painting, sensor, optical coding and information technology. ... J. Energy Storage, 27 (2020), Article 101078. View PDF View article View in Scopus Google Scholar [41] ... Highly stretchable ...

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Hydrogel photonics has emerged as a promising solution in the field of active photonics by providing primarily deformable geometric parameters in response to external ...

Photonic crystals, which are materials with periodic dielectric constants on the submicroscale, have been the focus of research for an extended period. Photonic soft materials have been extensively developed for use as ...

Hydrogels hold great promise for a variety of applications, from soft robotics to electrolytes in energy storage devices. However, their mechanical strength, stiffness and ...

The optical properties of these IO photonic structures have enabled them to be explored in applications like optics [10], sensors [19], photocatalysis [20], photoelectrocatalysis [21], and photovoltaics [22] besides other structure-based applications like catalysis [23], fuel cells [24], energy storage [10,25], drug delivery and tissue ...

Biopolymers used in photonics are mainly limited to linear optical color responses. Here, photon upconversion crystals incorporated into bacterial cellulose films demonstrate non-linear optical ...

In this study, a phase change hydrogel was developed by incorporating a hydrated salt, polymers, and carbon nanotubes (CNTs). The energy storage material used was ...

Recently, tunable photonic crystals (PhCs) have received great research interest, thanks to the wide range of applications in which they can be employed, such as light emission and sensing, among others. In addition, the ...

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