

A Copper Ion Sensitive Hydrogel Photonic Crystal Film

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Photonic crystals have a unique photonic band gap (PBG) property. The position of the photonic bandgap can be modulated by change the lattice spacing or refractive index in order to control the propagation of light. Hydrogel is a 3D polymer matrix with large amount of water that can undergo a volume phase transition when stimulated by the external environment. By combining the optical characteristics of photonic crystals with the stimulatory response of hydrogels enables the conversion of chemical signals to optical signals and the detection of ions. In this work, polystyrene (PS) nano-spheres were utilized to prepare photonic crystal templates with bright structural color by vertical deposition, and the mixture of hydroxyethyl methacrylate (HEMA) and vinyl imidazole (VIM) was injected into the photonic crystal templates and the hydrogel films were obtained by photo-polymerization under UV 365 nm exposure for 30 min. The obtained photonic crystal hydrogel films were sensitive to copper ion in buffer solution, the diffraction wavelengths blue-shifted with the copper ion concentration increased. The response time of photonic crystal hydrogel was 3 min, and the sensor film can be used for several times without property loss.

Keywords: Photonic crystals, Hydrogel , Sensor

