

PVA/SA Hydrogel Photonic Crystals as Visual Sensors

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The visualization sensor based on the hydrogel photonic crystal (PC) is hot spot of the electronic skin research. The PC with structural colors can be stabilized by the hydrogel network and then the change of the network structure affects the arrangement of the crystal lattice of PC. In this research, polyvinyl alcohol (PVA) and sodium alginate (SA) with excellent biocompatibility were blended to prepare PVA/SA hydrogel, and their mechanical and mechanical properties were characterized. When the mass ratio of PVA to SA is 2:1, the maximum breaking elongation of the hydrogel can reach 163%, and the maximum tensile strength can reach 0.18 MPa. Further, the optimized PVA/SA hydrogel was combined with PC that self-assembled from monodisperse polystyrene colloids. The as prepared PVA/SA-PC showed bright structure colors. Then, Ca^{2+} with good mixing mass ratio and conductivity were selected to test the mechanical and electrical properties of PVA/SA-PC films. Finally, a visual sensor was prepared that can detect Ca^{2+} ions as the hydrogel provides a carrier for the photonic crystals. The response results to Ca^{2+} indicate that PVA/SA-PC film has good signal detection ability. Through observing the color change of the film, the purpose of real-time monitoring and real-time feedback can be achieved. Therefore, this film has great potential for development in the field of visual sensing.

Keywords: Photonic Crystals; Hydrogel; Visual Sensors