

## Pattern Encryption on Hygroscopic Photonic Crystal composed of Macroporous Hydrogel

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Colloidal photonic crystals, containing a non-closed-packed array of colloid particles in a polymer, exhibit structural colors, and the structural colors can be easily tuned by changing the spacing between particles by applying external stimuli such as humidity, temperature, and the magnetic field. In this study, we design the hydrogel photonic film by dispersing monodispersed silica particles in a water-sensitive photocurable resin to observe the change of structural colors according to the water condition. In the case of a film having a porous structure by selectively removing silica particles, when the water evaporates, the porous structure is collapsed, and the film appears transparent without showing any structural colors. However, when the water gets absorbed, the structure gets restored, and the film exhibits vivid structural colors. As the structural colors are switched on and off depending on the water condition, the encrypted pattern, fabricated using hydrogel materials in a photolithographic process, can be applied to user-interactive anti-counterfeiting patches.