

## Colloidal Photonic Crystals for Structural Coloration

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The regular arrays of colloids diffract a light with wavelength of bandgap and do not allow its propagation. This bandgap effect in visible range appears iridescent color, which never fades as long as the structure remains intact. Therefore, the colloidal photonic crystals have a great potential in a wide range of optical applications including reflection-mode color display and aesthetic coloration. However, a pragmatic method to create such colloidal photonic crystals still remains an important challenge.

We have developed a pragmatic method for the creation of colloidal photonic crystals with controlled shape and optical properties. The repulsive colloidal particles dispersed in a liquid medium spontaneously form face-centered cubic lattices to minimize total interaction energy. This enables the fast crystallization without colloidal concentration. To stabilize the colloidal crystals formed in a liquid phase, a photocurable resin is used as a dispersion medium. The crystal lattices can be captured in a polymer matrix by rapid polymerization of the resin. This enables the production of highly transparent photonic films which exhibit a narrow reflectance peak. In addition, the films can be micropatterned by photolithography and stacked to make multiple reflectance peaks, which are potentially useful as invisible optical codes.