Pixellated Photonic Crystal Films by Selective Photo-polymerization

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Recently, it is challenging issue to develop a practical approach for hierarchical patterns with high resolution at micrometer scales inside photonic crystal films for the potential uses as display devices, optical communications, catalytic supports, biosensors, and acoustic materials. Here, we describe a simple and facile method for the two-dimensional array of pixellated colored cells by selective photon-induced polymerization in colloidal crystal films.

As shown in the experimental scheme, we have explored photolithography to pixellize the inverse opals. We used the selective reaction of a photo-curable prepolymer inside opaline colloidal crystal structures. Optical micrograph shows generated micropatterns with 50 micrometers pixell size and optical reflectance data give us the information about tunable band-gap properties over 100 nm range. These photonic materials can be applied as a color filter unit of the reflective microdisplay devices.