Electronic Supplementary Information

Protection against a wide UV wavelength range by Bragg reflection from polycrystalline colloidal photonic crystals

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Experimental procedure

A dispersion of monodisperse poly(methyl methacrylate) (PMMA) particles with a diameter of 160 or 80 nm (Nippon Shokubai Co., Ltd., MX-100W or MX-050W) was diluted in ultrapure water (Merck KGaA, Milli-Q) to a final concentration of 2.5 wt.% and was poured in a reservoir (inner diameter of 40 mm and a height of 13.5 mm, AS ONE Corp.). Quartz substrates (20 mm wide, 30 mm long, 1 mm thick) were treated with an ion coater (Eiko Co., Ltd., IB-3) to make the surface hydrophilic. Two double-stick tapes (Teraoka Seisakusho Co., Ltd., 707 and 7070), used as spacers, were sandwiched between the two quartz substrates and clipped to fabricate a fluidic cell. One of the openings of the cell was dipped in the dispersion and the entire reservoir was covered by a lid, except for the cell. The colloidal dispersion penetrated the space between the substrates and the water gradually evaporated from the upper opening of the cell. The colloidal crystals grew inside and across the cell from the top. The colloidal crystals with different thicknesses were prepared in the cells fabricated with different spacer thicknesses (10, 30, 50, and 70 μm). The cell containing the colloidal crystals was taken out of the dispersion, and the transmission and reflection spectra were measured using a UV-Vis spectrophotometer (JASCO Corp., V-670) and a multichannel spectrometer (Soma Optics Ltd., Fastevert S-2630), respectively. After drying the sample, the particle arrangement was observed using a scanning electron microscope (Keyence Corp., VE-8800). Absorption and transmission spectra of the aqueous dispersion of the PMMA particles with different particle volume concentrations were measured in the 50-μm-thick cell using the UV-Vis spectrophotometer.

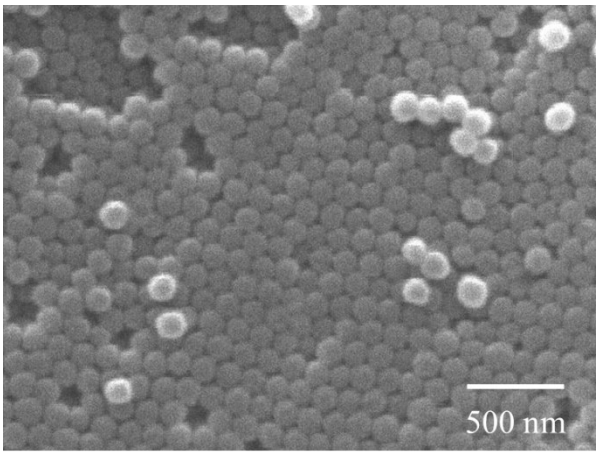

Figure S1 SEM image of the surface of the 10-μm-thick colloidal crystals after drying.

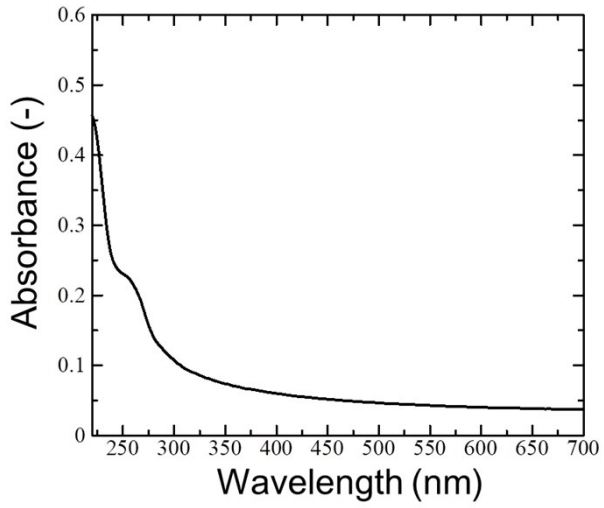

Figure S2 Absorption spectrum of the aqueous dispersion of the PMMA particles at the particle volume concentration of 0.1 vol.% in the 50-μm-thick cell.