

Photonic Janus Balls designed for Dynamic Structural-Color Tuning

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Colloidal crystals show structural colors through wavelength-selective diffraction at photonic stopband. Photonic Janus balls are formed when independent phases constituting particles are exposed to the continuous phase. In this work, a microfluidic system was used to produce paired drops of two distinct photocurable resins. The lighter resin contains magnetic nanoparticles, whereas heavier one contains silica particles at high volume fraction. The paired drops with density difference spontaneously align vertically. By photopolymerization under an external magnetic field, the magnetic moments of photonic Janus balls are uniformly aligned. With an external magnetic field, the photonic Janus balls align their magnetic moment to the field and adjust the degree to which their structural color is displayed. Distinct photonic Janus balls are enabled the simultaneous manipulation of orientation and allow for dynamic structural color expressions in a programmed manner.