

Supplementary Information

Lithographic compartmentalization of emulsion droplet templates for microparticles with multiple nanostructured compartments

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Materials and methods

Superparamagnetic colloidal nanocrystal clusters (CNCs) were prepared by a high-temperature hydrolysis reaction followed by silica layer coating.^{1,2} As the ultraviolet (UV)-curing resin, we chose ethoxylated trimethylolpropane triacrylate (Sigma Aldrich) with 10 wt% of photoinitiator (2,2-dimethoxy-2-phenylacetophenone, Sigma Aldrich). After the solvent of the CNC solution changed from water to the UV-curable resin³, the CNC-in-resin was emulsified in heavy mineral oil (Daejung) by mixing using a vortex. The CNC emulsion suspension was then poured onto a poly(dimethylsiloxane) (PDMS)-coated glass slide. A PDMS slab and a PDMS spacer (thickness: 300–500 μm) were placed on the suspension.

For achieving structural arrangements of CNCs and corresponding structural colour tuning, we applied an external magnetic field by using an NdFeB permanent magnet. Patterned UV light for lithographic photopolymerization was dynamically generated and irradiated by using a maskless lithography system comprising 200W mercury-xenon lamp (Hamamatsu), digital micromirror arrays (DMD, Texas Instrument), and optical microscope (IX71, Olympus). To obtain reflective images of microparticles, a true-colour charge coupled device (CCD) camera (DP71, Olympus) was used under off-axis illumination by a metal-halide lamp. The reflective spectrum was acquired by a CCD camera (PIXIS1024, Princeton Instruments) aligned with a spectrometer (SpectraPro2300i, Princeton Instruments). The entrance slit to the spectrometer was adjusted to receive light only from the region of interest.

References

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