

Supporting Information

S1 Temperature-controlled release and recovery of the synthesized microcapsule

The microcapsules were synthesized using 10% NIPAM (wt%, with 0.5% BIS) on microfluidic device as mentioned in the main text. Indium tin oxide (ITO) glass substrate pre-coated a thin layer of PDMS membrane was employed as heating device controlled by electricity on/off. A PDMS slab with a large hole (1mm diameter) was used to confine the water and the added microcapsules. Both the PDMS slab and the ITO substrate were bonded together by being treated with plasma to prevent any solvent leakage. The microcapsules were added into the hole with 500 μ L water, moreover, 100 μ L mineral oil was added on the top to avoid evaporation of water when heated. When power on, the hydrogel shell of the microcapsule dramatically shrunk as temperature of the ITO substrate increased, and the oil active was squeezed out (as shown in S1 a to c). However, the oil active was adhered to the shrunk shell in instead of being released completely even though the temperature reached $\sim 80^{\circ}\text{C}$. We believed that this was caused by the strong hydrophobic interactions between the hydrocarbon chains of the mineral oil active and hydrophobic groups of PNIPAM chains. Interestingly, when power off, the oil active would be slowly sucked back into the hydrogel shell (as shown in S1 d to e) as the temperature of the ITO substrate dropped. The process of release and recovery could be cycled for several times by controlling the power on and off without losing of oil active (data not shown).

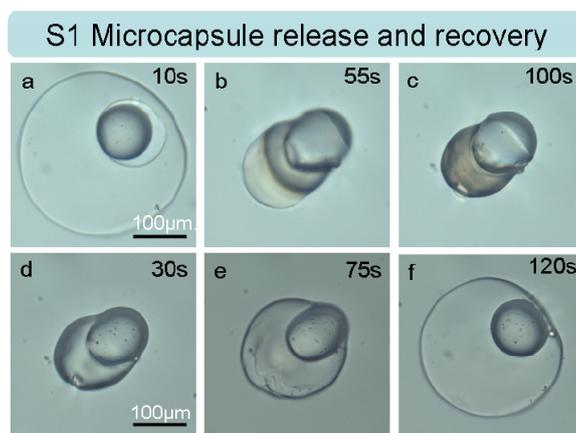


Figure S1. Process of the microcapsule release controlled by increasing temperature of ITO substrate as function of heating time (a to c) and microcapsule recovery when ITO substrate is cooled down at room temperature as a function of cooling time (d to f).

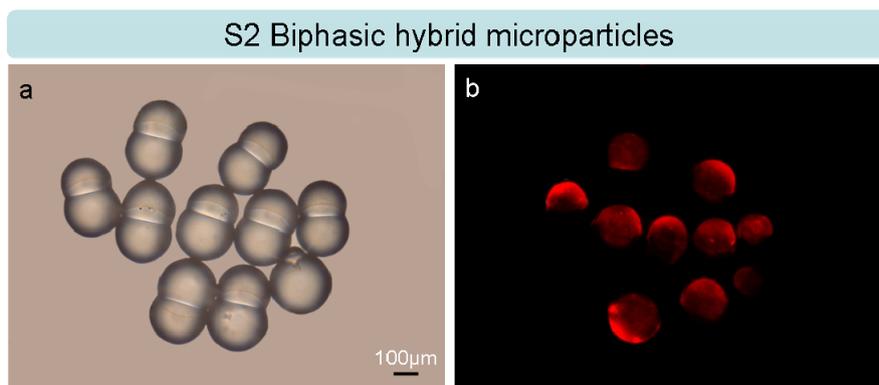


Figure S2. Optical microscope image (a) and fluorescence image (b) of biphasic hybrid microparticles with one hydrogel face and one oil face (red fluorescence in b).

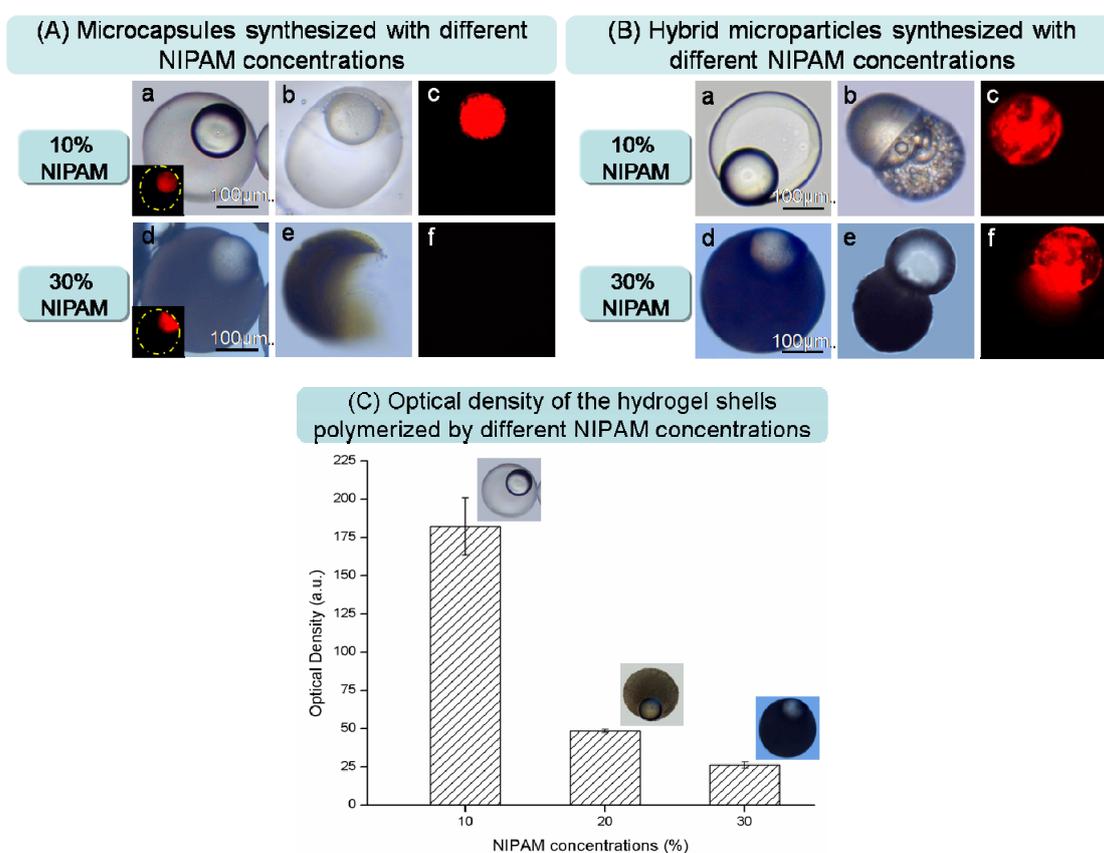


Figure S3. (A) Hydration release of microcapsules synthesized using 10% NIPAM monomer and 30% NIPAM monomer. The releasing results are shown as (b) and (e), correspondingly. (c) and (f) are associated fluorescence images. The insets in (a) and (d) denoted the fluorescence images of the microcapsules. (B) Biphasic hybrid microparticles fabricated by dehydration of microcapsules of 10% and 30% NIPAM, respectively. (b) and (e) denote the corresponding hybrid microparticles while (c) and (f) fluorescence images of the oil faces. (C) The plot of optical densities of the microcapsules as a function of NIPAM concentrations, revealing indirectly the transparencies. The insets showed the microcapsules at the corresponding NIPAM concentrations. Noticeably, the value of light density was also relevant to exposed time of UV solidifications and image acquisitions. a.u. denotes arbitrary unit.