Osmochromatic Microcapsules

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Precise control of particle concentration is of significant importance for creating reconfigurable colloidal photonic materials with high processibility and implementing photonic applications. We report a microfluidic encapsulation of colloidal photonic structure and their dynamic control using a mean of osmosis-induced concentration. The encapsulated colloidal suspensions or 'photonic inks' exhibit concentration-dependent structural color which can be controllable for individual capsule by osmotic pressure-induced shrinkage of the liquid capsules. The photonic structures can be further stabilized by polymerization of the liquid membrane into rigid solid or flexible rubber. The rubber photonic capsules exhibit a reversible change of their volume depending on osmotic pressure; this provides osmochromatic properties. In addition, they are highly reconfigurable in their shape, thereby enabling their dense packing. The high encapsulation efficiency and high capsule uniformity of this microfluidic approach, as well as its unprecedented controllability over photonic properties and high reconfigurability over shapes, will provide new opportunities for photonic applications.