Swelling and Deswelling Behavior of Poly(N-isopropylacrylamide)-polydimethylsiloxane composites

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Recently, artificial co-continuous composites of hydrophilic polymers and hydrophobic polymers have been developed to improve the properties of hydrogels or rubbers. In this study, water swelling and deswelling was controlled by using thermo-sensitive poly (N-isopropylacrylamide) (PNIPAm) and polydimethylsiloxane (PDMS) composites. The composites were prepared by directional freezing of PNIPAm hydrogels to produce cylindrical pores, and the subsequent infiltration of PDMS substrate to the end of micro-channeled PNIPAm. The composites can repeat shrinking and swelling in water following the temperature cycles, and as they shrink, the water droplets can form and roll over the substrate. We expected that this system will be useful for small-scale devices which need to control water flow.