Contractile frameworks of optically commanded switches: towards a mechanized nano-sponge

The integration of photoswitchable elements into porous solids provides opportunities to govern material responses to optical stimuli, provided the switch preserves its function in the solid state. Fully optical, reversible light-driven switching frameworks are presented using the polymerization of a hexadentate photoswitchable monomer by a Yamamoto coupling reaction to yield high switch concentration in the porous covalent architecture. The framework exhibits a highly selective reversible photoisomerization of the embedded overcrowded-alkene by distinct wavelengths in the visible region, accompanied by amplification of the light-triggered nanoscale photoswitch motion to induce a sponge-like behavior. In turn, this drives a cooperative reorganization of micro and mesopores leading to modulation of gas sorption on selective commanded by light with the potential of high spatial-temporal precision in modulation porous materials.