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Novel Photo-responsive Structures for microSensors and microActuators

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The continuing interest in stimuli-responsive materials has yielded quite an expansive variety of smart materials that respond to a wide range of stimuli such as electrical current, pH and light, among others [1]. A subclass of this family is comprised of stimuli-responsive hydrogels that are three-dimensional, hydrophilic, polymer networks capable of large water intake. Incorporation of responsive units in such polymeric networks allows for their use as micro-machines capable of doing mechanical work in response to the chosen stimulus. The application of smart materials offers tangible solutions in the field of actuators for microfluidic valves, artificial muscles and biomimetic robots [2-5].

Moreover, new capabilities such as motility, switchable selective uptake and release of molecular agents, sensing, signalling and seeking, will enable microstructures and micro-vehicles to manifest many of the features of biological entities.

Herein we explore several bioinspired stimuli-responsive microstructures for actuation and sensing. A particular focus will be the emphasis on the important role of light as a means to enable control and interrogate stimuli-responsive materials, and exploration on how these might provide initial building blocks for creating futuristic microsystems.

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