Photo-actuated Communicating Devices

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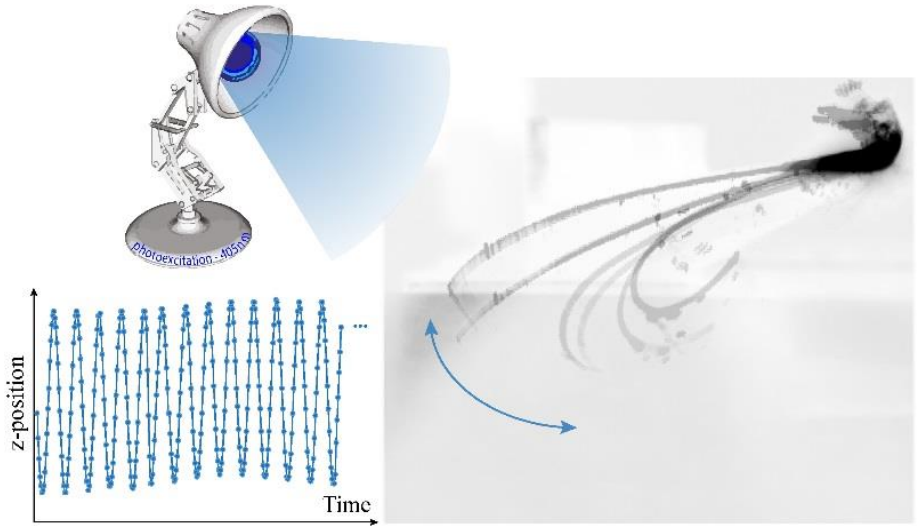
Connecting molecular switches to the macroscopic world is a challenge where the work performed at the molecular scale is translated to the production of desired operations in functional devices. Only few examples are reported of translating the out-of-equilibrium state of molecules to achieve continuous macroscopic motion of materials.[1] Liquid crystal network (LCN) is a class of materials recently employed to create films with triggered macroscopic deformation and self-sustained oscillation.[2] Their inherent anisotropy amplifies the collective molecular motion of switches incorporated within the network.[3] We found lately a general approach to generate mechanical oscillation of LCN under constant light irradiation.[4,5] The frequency of the oscillation depends on the modulus and the dimensions of the film, while the amplitude varies with the light intensity. The mechanism originates from the subtle balance between the photo-thermal effect of photo-stabilizers and the thermal expansion/relaxation of the LCN coupled with a self-shadowing effect. The outcome of this research is extended from UV to near-IR actuation, making bulk applications to convert sunlight into mechanical work in energy harvesting and micro-robotics within reach.



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