Harnessing Unidirectional Deformation Driven by Light and Temperature: Towards Untethered Soft Microgripper in Diverse Environments

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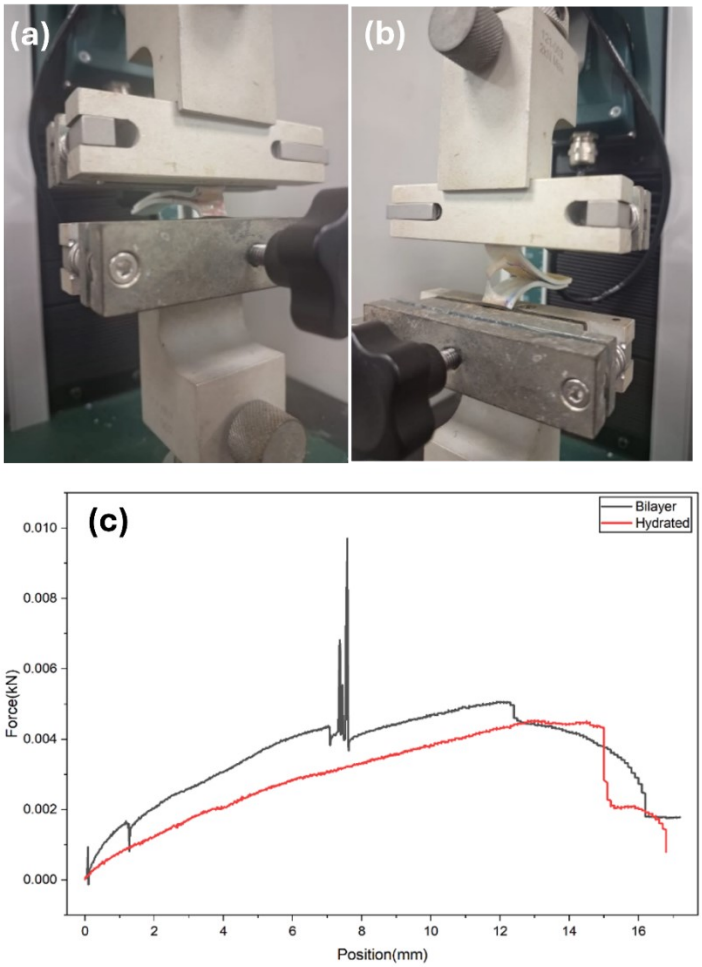

Fig. S1: (a) The peel-off test setup, (b) Failure of the hydrated sample during the peel-off test, and (c) Typical force-displacement curves obtained from the T-peel test for the bilayer under dried and hydrated conditions.

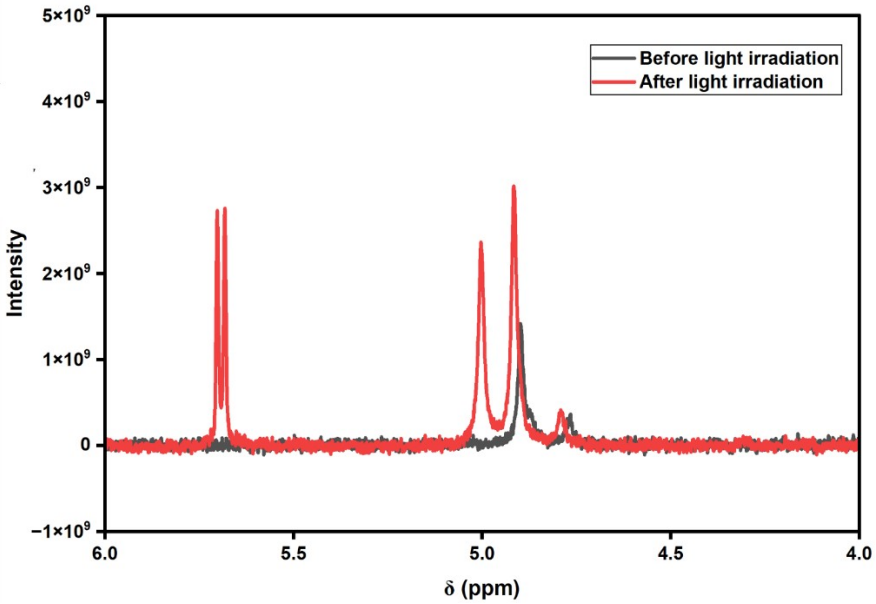

Fig. S2: ^{1}H solution NMR spectra of the functionalized anthracene dye before and after light irradiation.

Table S1: Comparative table benchmarking the performance of the actuator.

Design	Stimulus	Response Time	Bending angle	Reference
SP-PAAm/PAAm bilayer	Blue light	30 min	40°	[5]
BIFA functionalized poly(MAA-co-OEGMA)	Blue light	45 min	40°	[6]
PNIPAM/Spiropyran	Blue light	20 min	78°	[7]
PNIPAM/Spiropyran	Blue light	5 min	78°	[8]
PAAc-Spiropyran bilayer Hydrogel	Blue light	4 min	69.6°	[9]
PNIPAM/PVA-An bilayer hydrogel	Blue light	3 sec	153°	Current work
PNIPAM/TOCN/PAM bilayer	Temperature 50 °C	60 sec	390°	[10]
PNIPAM/P(AAm-co-AAc) bilayer	Temperature 60 °C	30 sec	150°	[11]
PNIPAM microgel/ weighting paper	Temperature 50 °C	80 sec	730°	[12]
AG/NIPAM bilayer	Temperature 50 °C	18 sec	360°	[13]
PNIPAM/PVA-An bilayer hydrogel	Temperature 40 °C	60 sec	Complete scrolling	Current work

Supporting Videos:

Supplementary Video 1: Photoresponsive actuation of 5 mM film in blue light.

https://drive.google.com/file/d/1t-Upa82lj1KWxuJ8_YHLuvyxu0yLy_fj/view?usp=sharing

Supplementary Video 2: Photoresponsive actuation of 10 mM film in blue light.

https://drive.google.com/file/d/1AhgPHRzpQzK_49YhlrQSl_0-OAOVUvZ2/view?usp=sharing

Supplementary Video 3: Photoresponsive actuation of 20 mM film in blue light.

https://drive.google.com/file/d/1HlHXhKcLY-j4MLDPQtNTQdLwM8Wwmme_/view?usp=sharing