

**Multifunctional actuators integrated with the function of self-powered
temperature sensing made with $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites**

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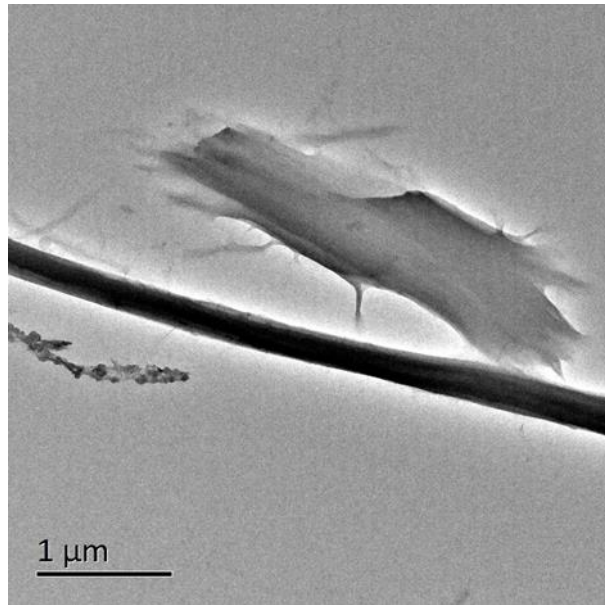


Fig. S1 TEM image of the bamboo nanofiber.

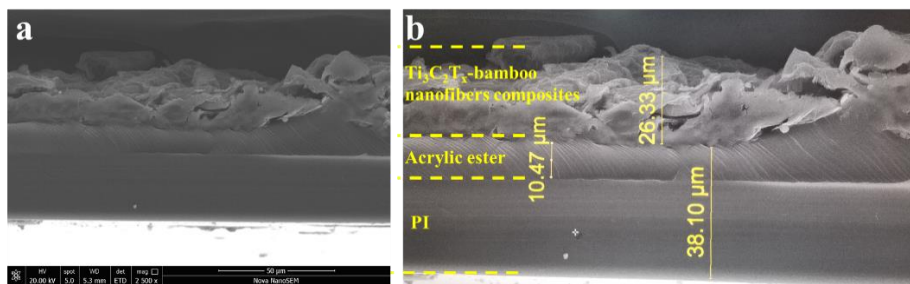


Fig. S2 (a) Cross-sectional SEM image of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI actuator. (b) Thickness measurement SEM image of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI actuator.

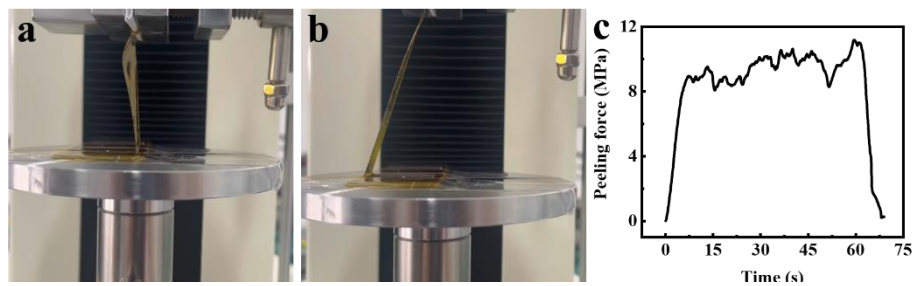


Fig. S3 Optical photos of the $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI actuator peeling experiment at the beginning (a) and at the end (b). (c) Peeling force of the $\text{Ti}_3\text{C}_2\text{T}_x$ bamboo nanofiber/PI actuator.

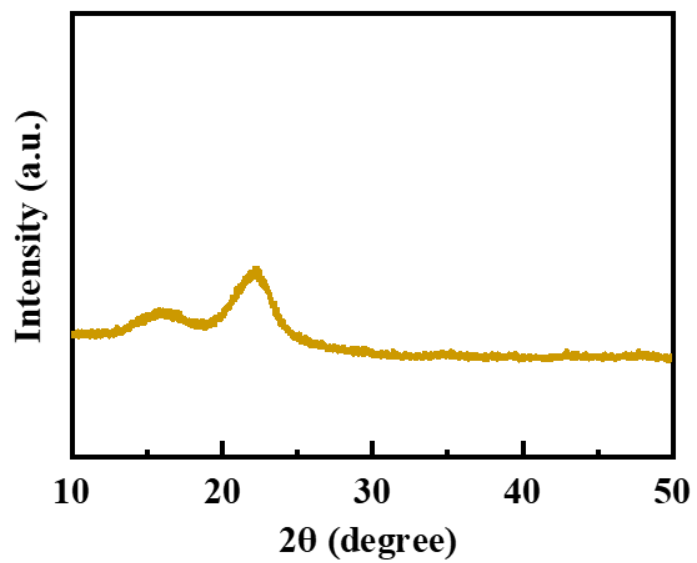


Fig. S4 XRD pattern of the bamboo nanofibers.

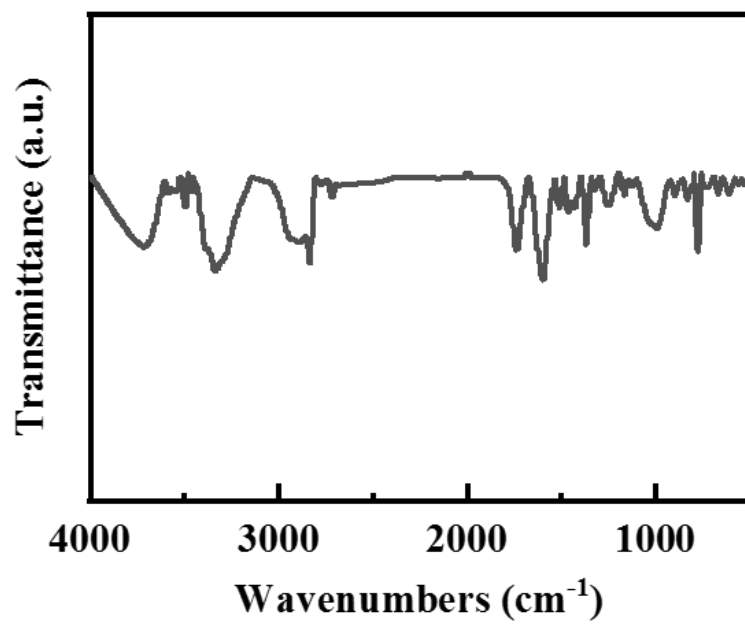


Fig. S5 FTIR spectrum of the bamboo nanofibers.

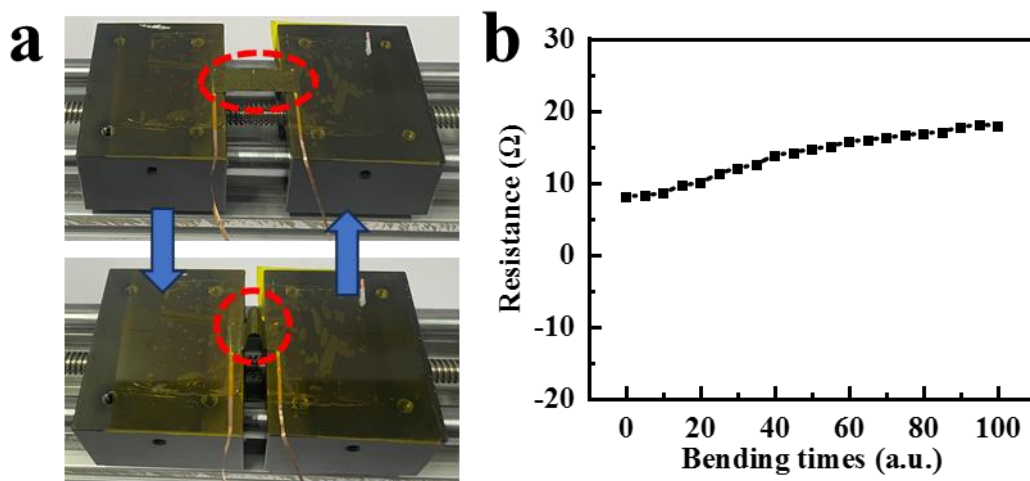


Fig. S6 Mechanical stability of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites. (a) Optical photos of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites in cyclic stability test. (b) Resistance of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites in cycling test.

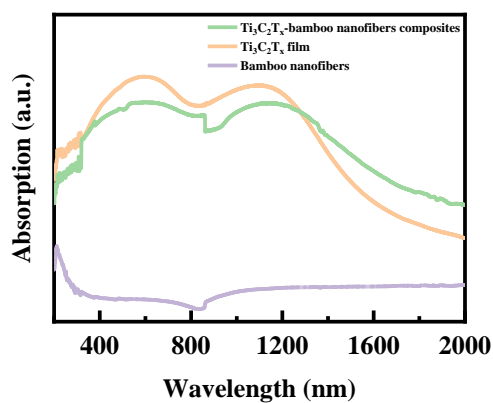


Fig. S7 UV-vis-NIR absorption spectra of bamboo nanofibers, $\text{Ti}_3\text{C}_2\text{T}_x$ film and $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites.

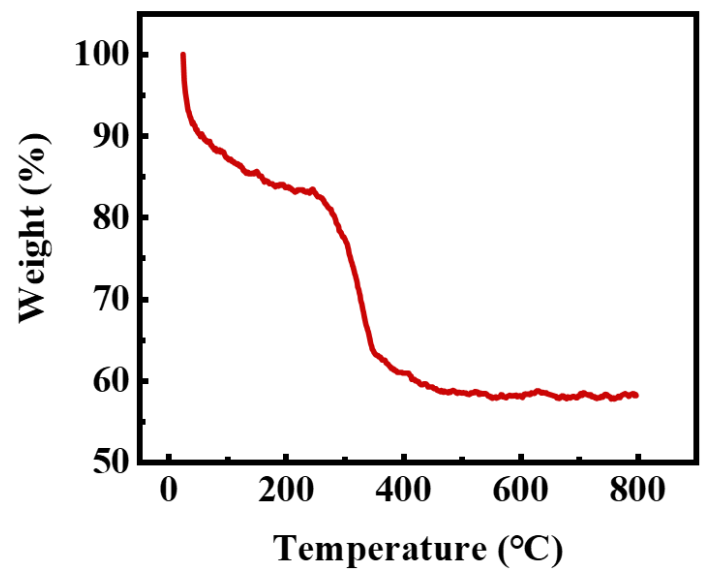


Fig. S8 TGA curve of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofibers composites.

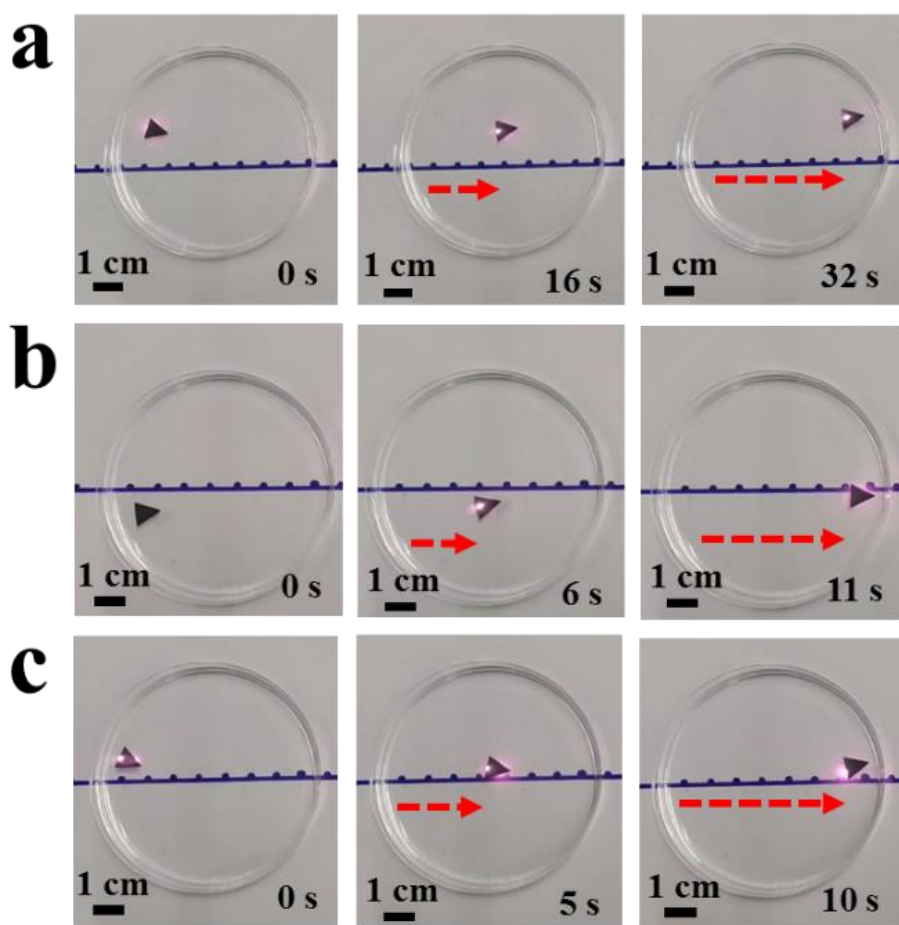


Fig. S9 Experiments on the effect of NIR light power intensity on $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator. (a) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator under NIR light with 40 mW cm^{-2} and corresponding infrared thermal images. (b) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator under NIR light with 80 mW cm^{-2} and corresponding infrared thermal images. (c) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator under NIR light with 100 mW cm^{-2} and corresponding infrared thermal images.

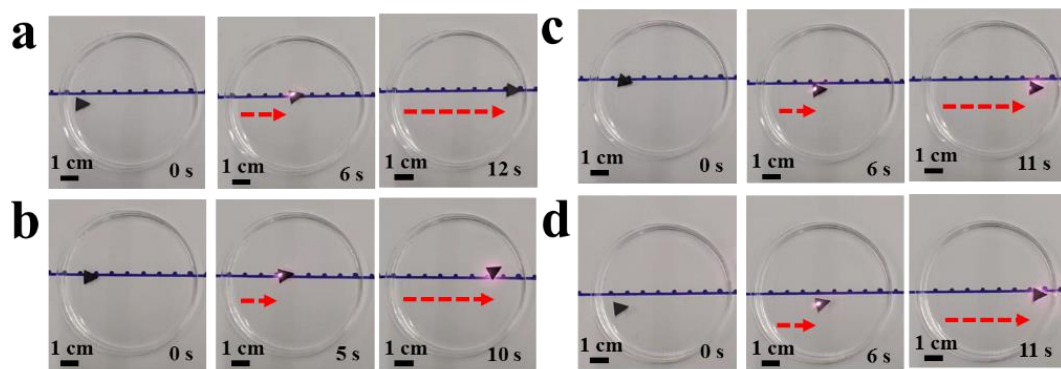


Fig. S10 The influence tests of solution properties on the locomotion speed of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator. (a) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator in acidic solution ($1 \text{ mol L}^{-1} \text{ HCl}$) and corresponding infrared thermal images. (b) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator in alkaline solution ($1 \text{ mol L}^{-1} \text{ NaOH}$) and corresponding infrared thermal images. (c) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator in salt solution ($1 \text{ mol L}^{-1} \text{ NaCl}$) and corresponding infrared thermal images. (d) Optical photos of the locomotion of $\text{Ti}_3\text{C}_2\text{T}_x$ -bamboo nanofiber/PI light-driven floating actuator in deionized water and corresponding infrared thermal images.

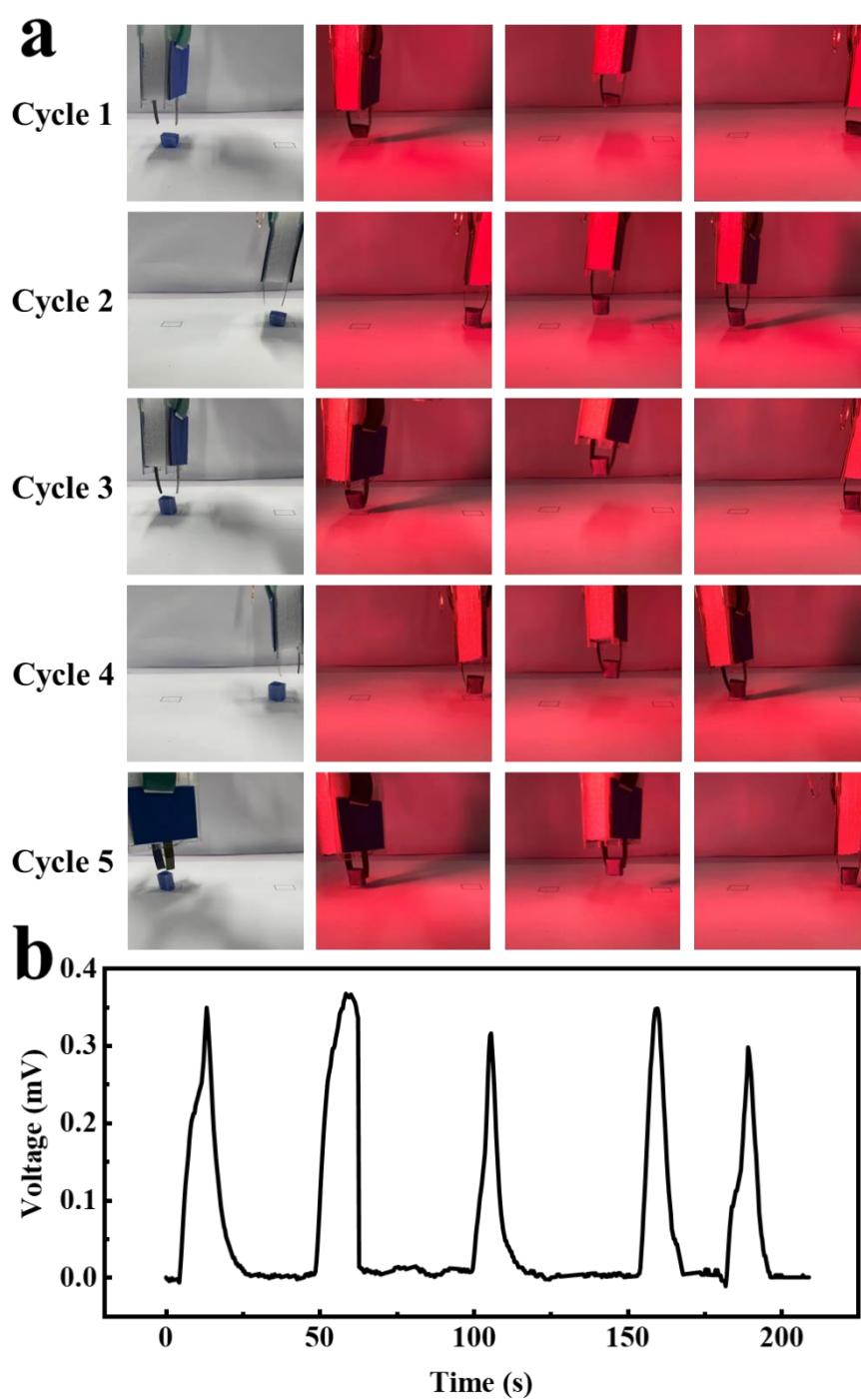


Fig. S11 Cyclic stability test of the multifunctional gripper. (a) Optical photos of the multifunctional gripper under a five-times light-driven cycles. (b) Output voltage of the multifunctional gripper under a five-times light-driven cycles.