

A Polymeric Bilayer Multi-Legged Soft Millirobot with Dual Actuation and Humidity Sensing

Shidai Tian ^{1,2,†}, Shijie Li ^{1,2,†}, Yijie Hu ^{1,2}, Wei Wang ^{2,3}, Aifang Yu ^{1,2,3,*}, Lingyu Wan ^{1,*} and Junyi Zhai ^{1,2,3,*}

¹ Center on Nanoenergy Research, School of Physical Science and Technology, Guangxi University, Nanning 530004, China; tianshidai@binn.cas.cn (S.T.); lishijie@binn.cas.cn (S.L.); huyijie@binn.cas.cn (Y.H.)

² CAS Center for Excellence in Nanoscience, Beijing Key Laboratory of Micro-nano Energy and Sensor, Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, Beijing 100083, China; weiwang@binn.cas.cn

³ College of Nanoscience and Technology, University of Chinese Academy of Science, Beijing 100049, China

* Correspondence: yuaifang@binn.cas.cn (A.Y.); LYW2017@gxu.edu.cn (L.W.); jyzhai@binn.cas.cn (J.Z.)

† These authors contributed equally to this work.

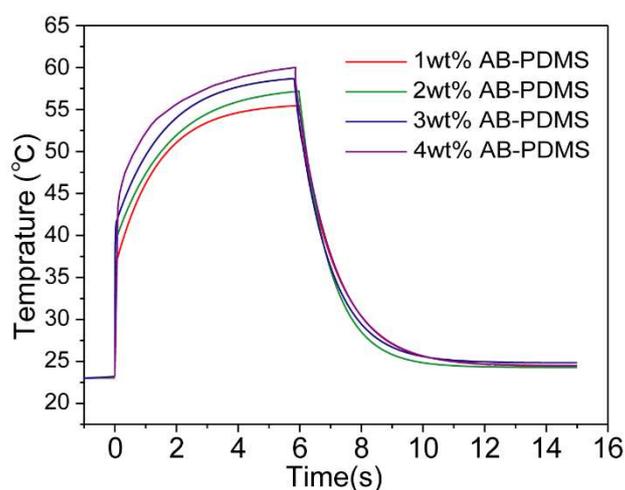


Figure S1. Temperature change of the actuator working in water.

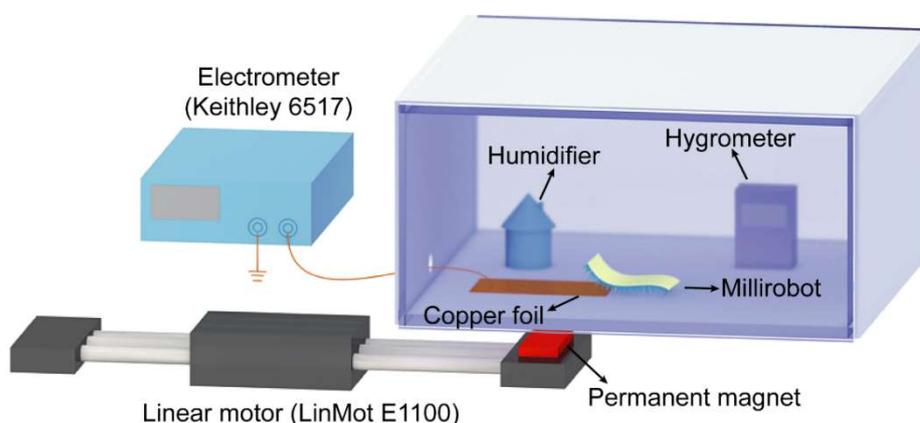


Figure S2. Schematic of the millirobot-TENG measurement set-ups.

Supplementary Movies

Movie S1. Real-time temperature changes of the polymeric bilayer platform with 4wt% AB concentration under infrared light irradiation (90mW cm^{-2}).

Movie S2. Locomotion of the multi-legged millirobot in the light-driven mode, including a plane motion, forward, up-hill, swimming on the water and turning around.

Movie S3. Motion of the multi-legged millirobot in the magnetic-induced mode, including a plane motion, climbing a slope, walking in the water.

Movie S4. Load capacity test of the multi-legged millirobot, including loading a 30mg pill (10 times heavier of its own weight) in the light-driven mode and loading a 60mg tablet (20 times heavier of its own weight) in the magnetic-induced mode.

Movie S5. Humidity signals harvested from millirobot-TENG under stimulation of a magnetic field and execute the same compulsory exercise in the light-driven mode.