Mechano Regulated Metal Organic Framework Nanofilm for Ultrasensitive and Anti Jamming Strain Sensing

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Effectively and purposefully modulating the charge transport process, and successfully designing a functional electrical device always are the crucial issue for metal-organic frameworks (MOFs). Herein, we report a strategy for realizing tunable conductivity in MOFs I_2@CuTCA (H_3TCA = tricarboxytriphenyl amine) through shrinkage and expansion of frameworks upon the external applied strain (Figure 1). A molecular dynamics simulation and experimental observations suggest the performance are strongly regulated by the related movement of guest molecular I_2 in the nanochannels through strain-induced shrinkage and expansion of the frameworks in I_2@CuTCA. More importantly, we have developed a smart and low-cost kneecap based on the experimental phenomenon, which can precisely count the step of our sporting by the large motion of knee joint (Figure 2). Through the period and amplitude, we could estimate how much energy we have burned during running, walking and riding which is helpful for the bodybuilding and lost weight. The discovery of strain-induced resistive switching behavior in MOFS offers great potential as sensors in future wearable electronic devices [1-2].

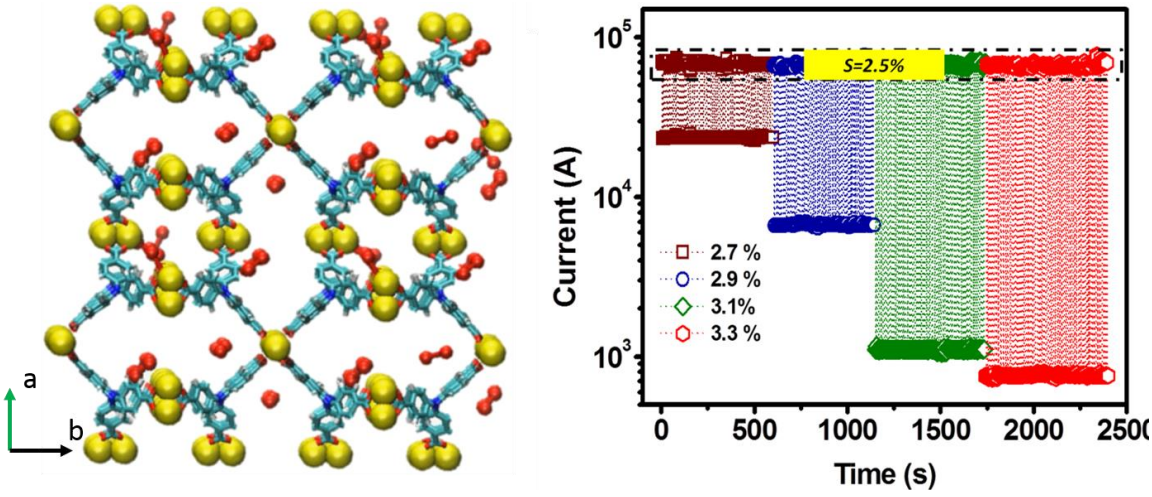

Figure 1 The crystal structure of I2@CuTCA along c-axis, the guest molecular I2 (red) are random located around the N from tricarboxytriphenyl amine and Uniform and endurance performance of the Au/ I2@CuTCA/Au/PET between 2.5% and a larger strain 2.7%, 2.9%, 3.1% and 3.3%.

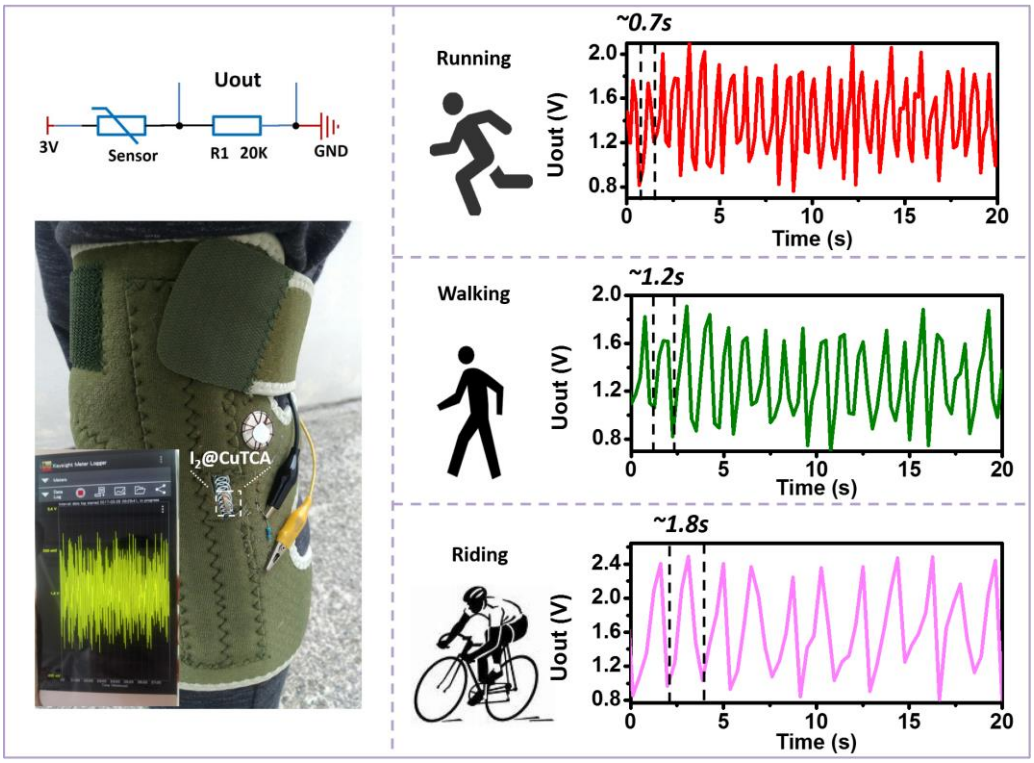

Figure 2 The Schematic of kneecap, the signal from running, walking and riding.

[1] Pan, L.; Liu G.; Li H.; Meng S.; Han L.; Shang J.; Chen B.; Platero-Prats A. E.; Lu W.; Zou X.; Li R-W. "A Resistance-Switchable and Ferroelectric Metal Organic Framework." *Journal of the American Chemical Society.* **2014**, *136*, 17477-17483.

[2] Liu, Y.; Wang, H.; Shi, W.; Zhang, W.; Yu, J.; Chandran, B. K.; Cui, C.; Zhu, B.; Liu, Z.; Li, B.; Xu, C.; Xu, Z.; Li, S.; Huang, W.; Huo, F.; Chen, X. "Alcohol mediated resistance switching behavior in metal-organic frameworks based electronic devices," *Angew. Chem. Int. Ed.* **2016**, *55*, 8884-8888.