

Supporting information

M-rGO modified polyurethane yarn enhanced by epoxy/thiol-reaction for applications of strain sensor

Shichen Zhang¹, Yue Sun², Jiangtao Xu³✉

1. School of Innovation Design, Guangzhou Academy of Fine Arts, Guangzhou 510006, China

2. School of Fashion Design & Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China

3. Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hong Kong, 999077, China

Corresponding author: Jiangtao Xu, xjt2511@163.com

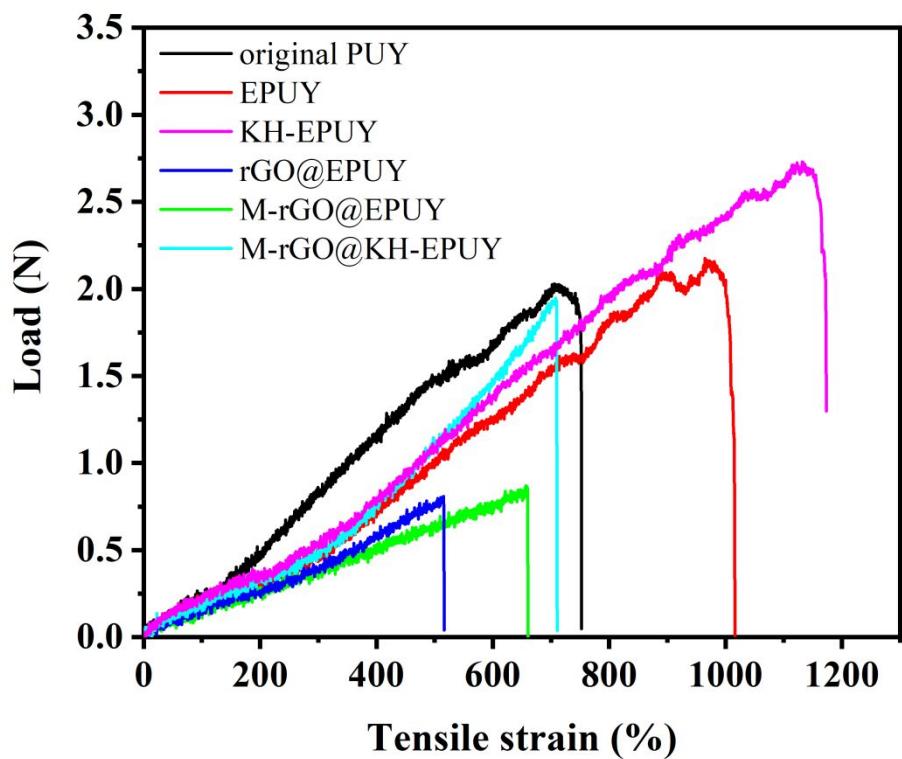


Figure S1 Mechanical performance of yarn with and without treatment

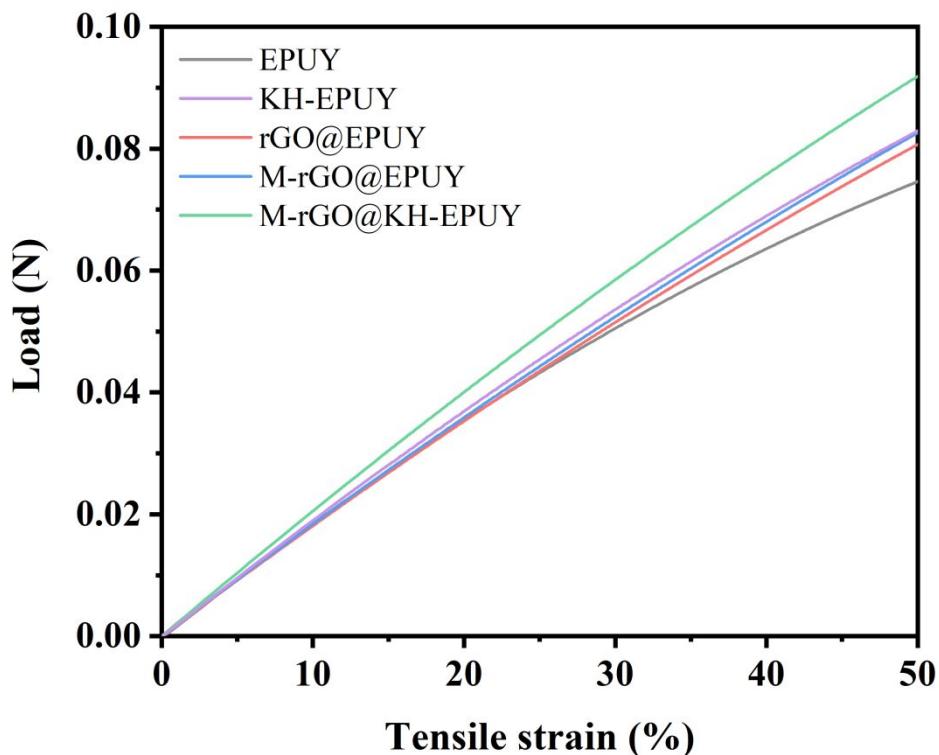


Figure S2 Mechanical performance of yarn with treatment under a strain of 50%

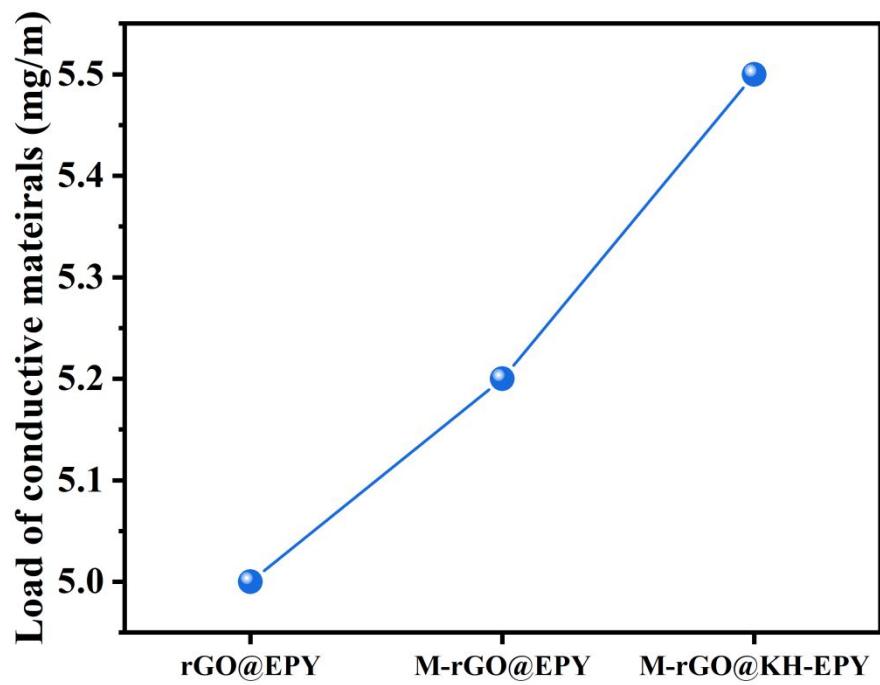


Figure S3 Mass load of conductive materials

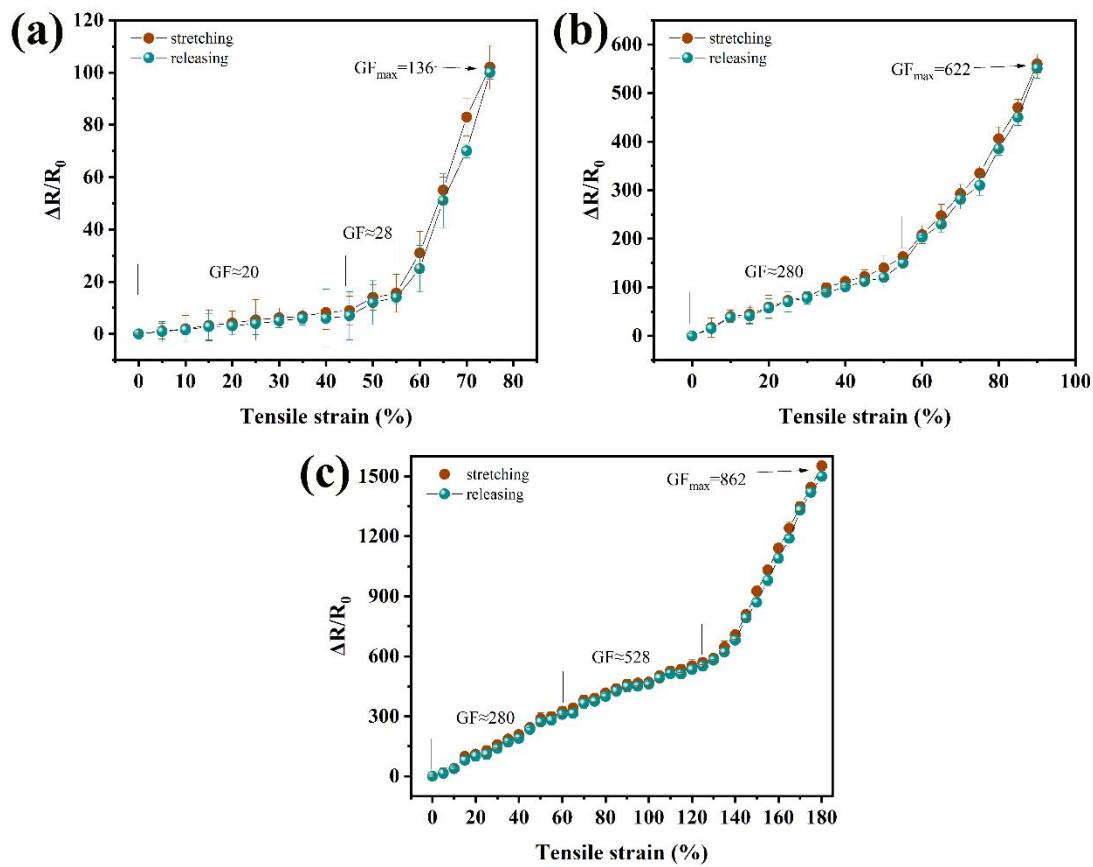


Figure S4 Electrical resistance change of the sensors during stretching and releasing process

Table S1 Comparison of the maximum gauge factor of reported strain sensors

| Used Materials | Gauge factor | References |
|---------------------------|--------------|------------|
| Graphene | 300 | 1 |
| Ag nanowires/PDMS | 20 | 2 |
| CNT | 12 | 3 |
| Carbonized cotton | 25 | 4 |
| Graphene/PVA | 86.8 | 5 |
| CNT/cellulose | 538 | 6 |
| Graphene/PDMS | 490 | 7 |
| Ag/composites | 659 | 8 |
| graphite-based composites | 522.6 | 9 |

Reference:

1. Zhao, J.; He, C.; Yang, R.; Shi, Z.; Cheng, M.; Yang, W.; Xie, G.; Wang, D.; Shi, D.; Zhang, G., Ultra-sensitive strain sensors based on piezoresistive nanographene films. *Applied Physics Letters* **2012**, *101* (6).
2. Kim, K. K.; Hong, S.; Cho, H. M.; Lee, J.; Suh, Y. D.; Ham, J.; Ko, S. H., Highly Sensitive and Stretchable Multidimensional Strain Sensor with Prestrained Anisotropic Metal Nanowire Percolation Networks. *Nano Lett* **2015**, *15* (8), 5240-7.
3. Li, C.; Cui, Y. L.; Tian, G. L.; Shu, Y.; Wang, X. F.; Tian, H.; Yang, Y.; Wei, F.; Ren, T. L., Flexible CNT-array double helices Strain Sensor with high stretchability for Motion Capture. *Sci Rep* **2015**, *5*, 15554.
4. Zhang, M.; Wang, C.; Wang, H.; Jian, M.; Hao, X.; Zhang, Y., Carbonized Cotton Fabric for High-Performance Wearable Strain Sensors. *Advanced Functional Materials* **2017**, *27* (2).
5. Li, X.; Hua, T.; Xu, B., Electromechanical properties of a yarn strain sensor with graphene-sheath/polyurethane-core. *Carbon* **2017**, *118*, 686-698.
6. Zhu, L.; Zhou, X.; Liu, Y.; Fu, Q., Highly Sensitive, Ultrastretchable Strain Sensors Prepared by Pumping Hybrid Fillers of Carbon Nanotubes/Cellulose Nanocrystal into Electrospun Polyurethane Membranes. *ACS Appl Mater Interfaces* **2019**, *11* (13), 12968-12977.
7. Li, X.; Hu, H.; Hua, T.; Xu, B.; Jiang, S., Wearable strain sensing textile based on one-dimensional stretchable and weavable yarn sensors. *Nano Research* **2018**, *11* (11), 5799-5811.
8. Lee, J.; Shin, S.; Lee, S.; Song, J.; Kang, S.; Han, H.; Kim, S.; Kim, S.; Seo, J.; Kim, D.; Lee, T., Highly Sensitive Multifilament Fiber Strain Sensors with Ultrabroad Sensing Range for Textile Electronics. *ACS Nano* **2018**, *12* (5), 4259-4268.
9. Amjadi, M.; Turan, M.; Clementson, C. P.; Sitti, M., Parallel Microcracks-based Ultrasensitive and Highly Stretchable Strain Sensors. *ACS Applied Materials & Interfaces* **2016**, *8* (8), 5618-5626.