Supplementary Information (SI) for Materials Advances.
This journal is © The Royal Society of Chemistry 2024

Supporting Information

Highly tensile and sensitive strain sensors with micro-nano topology optimization

Weixia Lan[a], Qiqi Ding[a], Tao Zhou[a], Zilong Guo[a], Wenbin Sun[a], Zhenghui Wu[b], Yingjie Liao[a]*, Bin Wei[a] and Yuanyuan Liu[a]**

a. School of Mechatronic Engineering and Automation, Shanghai University, Shanghai 200444, China.

b. Key Laboratory for Special Functional Materials of Ministry of Education, School of Nanoscience and Materials Engineering, Henan University, Kaifeng 475004, China

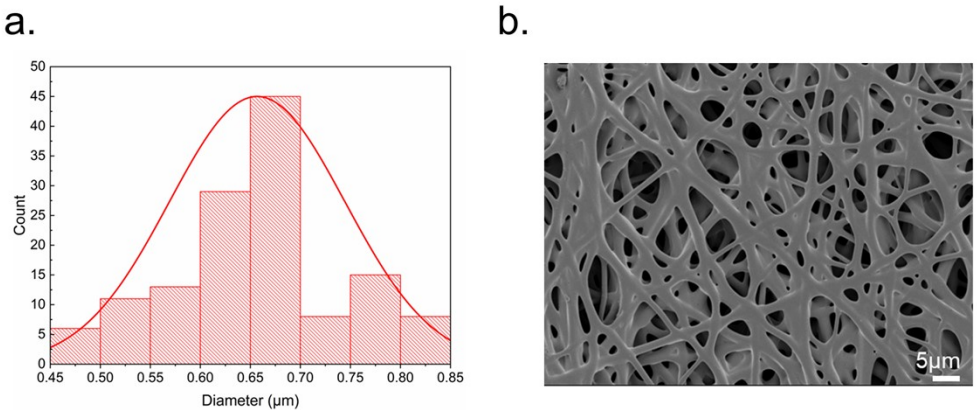

Figure S1. (a.) Pure-TPU fiber diameter distribution membrane; (b.) SEM image of TPU/PEO6.

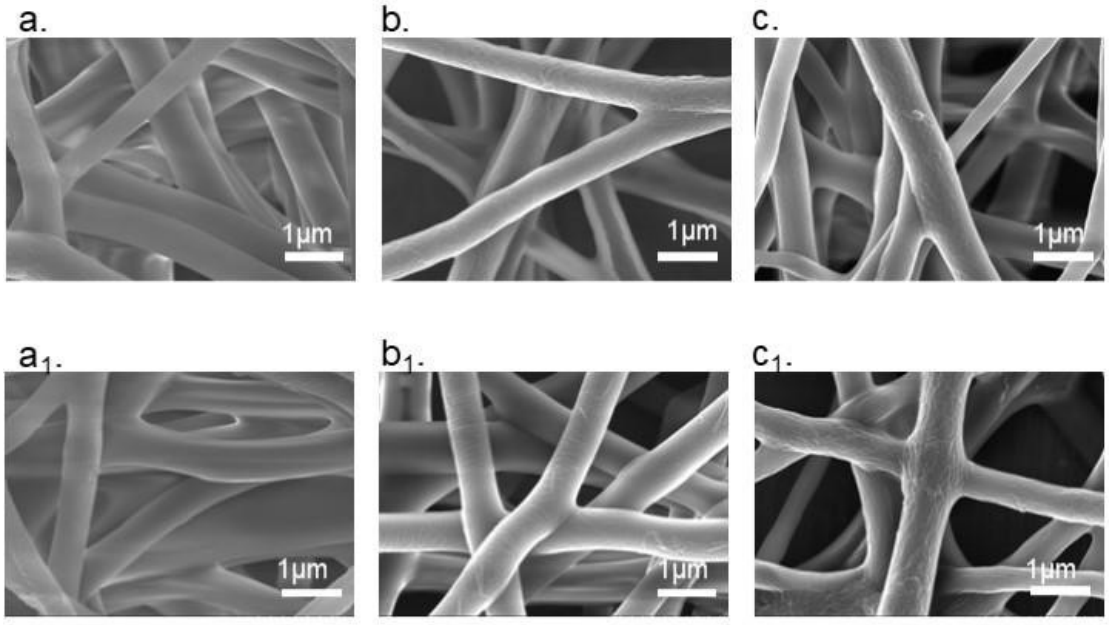

Figure S2. SEM images of Pure-TPU nanofiber membrane (a.), TPU/PEO2 nanofiber membrane (b.) and TPU/PEO4 nanofiber membrane (c.); SEM images of etched Pure-TPU nanofiber membrane (a_1.), etched TPU/PEO2 nanofiber membrane (b_1.) and etched TPU/PEO4 nanofiber membrane (c_1.)

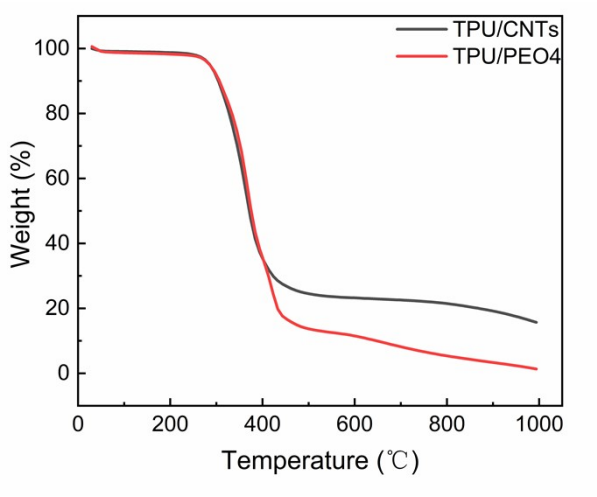

Figure S3. TGA testing of TPU/PEO4 fibers and TPU/CNTs composites.

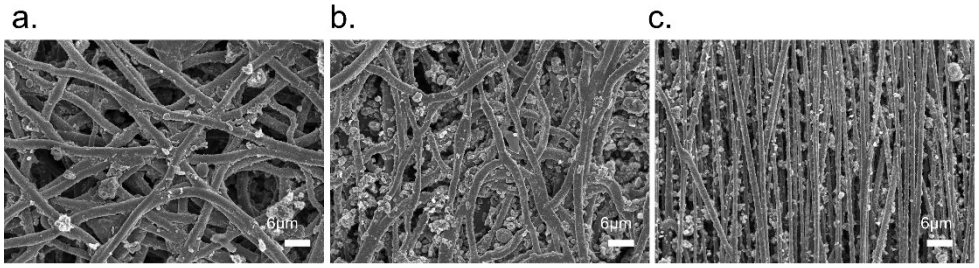

Figure S4. TPU:PEO/CNTs sensor (a.) initial fiber state, (b.) under small strain and (c) under large strain.

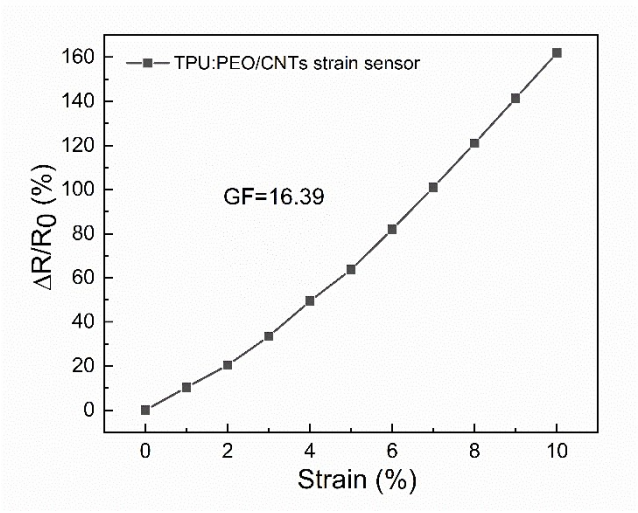

Figure S5. Diagram of the sensing performance of TPU:PEO/CNTs strain sensor at small strain

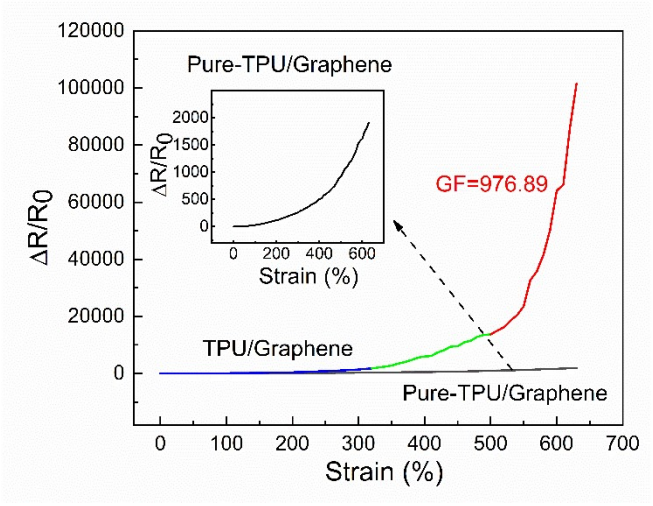

Figure S6. Diagram of the sensing performance of TPU/Graphene and Pure-TPU/Graphene strain sensors.

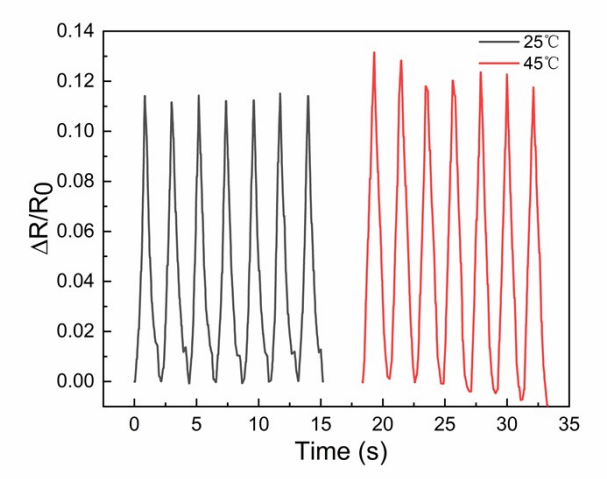

Figure S7. TPU/CNTs sensor 2.5% signal variation at 25°C vs. 45°C.

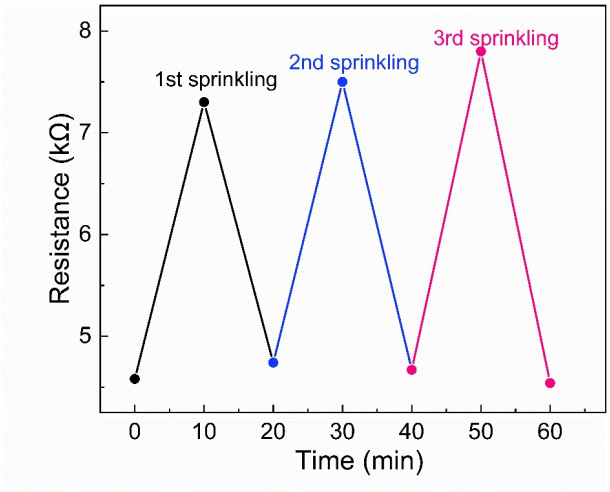

Figure S8. Resistance changes of TPU/CNTs sensor for three sprinklings.

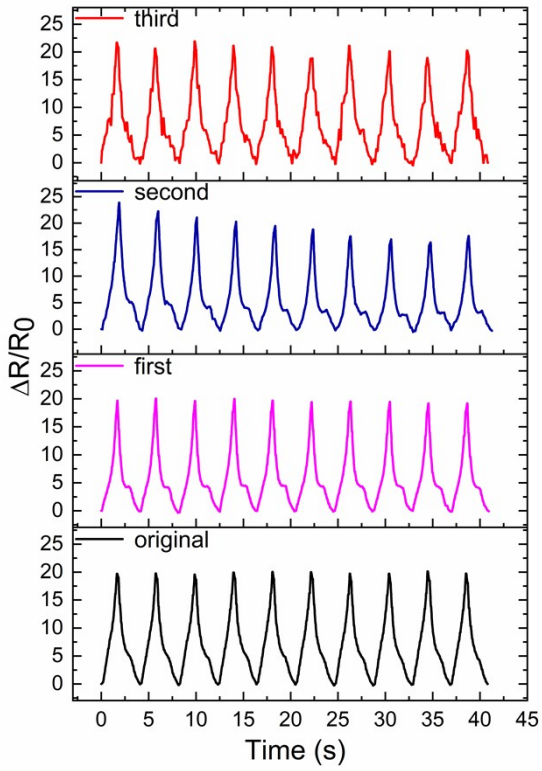

Figure S9. The signal changes when the resistance is stretched by 80% after three sprinklings.

Table 1. Comparison of the maximum working range and maximum GF of this work with other references

Maximum strain range	Max GF	Conductive Material	Substrate Materials	Reference
50%	68	MWCNTs/CB	TPU	[6]
400%	67.2	CNTs	TPU	[12]
201%	22.7	CNFs	PEDOT	[15]
140%	41.69	GR	TPU	[20]
20%	141.6	SiC/GCM	TPU	[21]
120%	184.64	CNTs/GN	TPU	[22]
700%	17.8	Mxene/CNTs	TPU	[25]
180%	59	TTS@PDA@PPy	TPU	[30]
100%	1.44	MWCNTs	PDMS	[36]
350%	27.2	CNTs	SEBS	[38]
900%	19.96	CNTs	TPU	[44]
450%	98.52	CNTs	TPU	This work