A facile structural strategy for a wearable strain sensor based on carbon nanotubes modified helical yarns

Wei Zhao [a, b, d * #], *Sheng Xu* [a, c #]

a School of Chemical and Material Engineering, Jiangnan University, Wuxi, Jiangsu Province, 214122, P. R. China

b Department of Mechanical Engineering, University of Delaware, Newark, Delaware 19716, United States

c School of Textiles and Clothing, Jiangnan University, Wuxi, Jiangsu Province, 214122, P. R. China

d Xin Feng Ming Group Co., Ltd, Tongxiang, Zhejiang Province, 314500, P. R. China

Corresponding Author

* E-mail addresses: zwchouvie@163.com

[#] W. Z. and S. X. contributed equally to this work.

Supplementary data

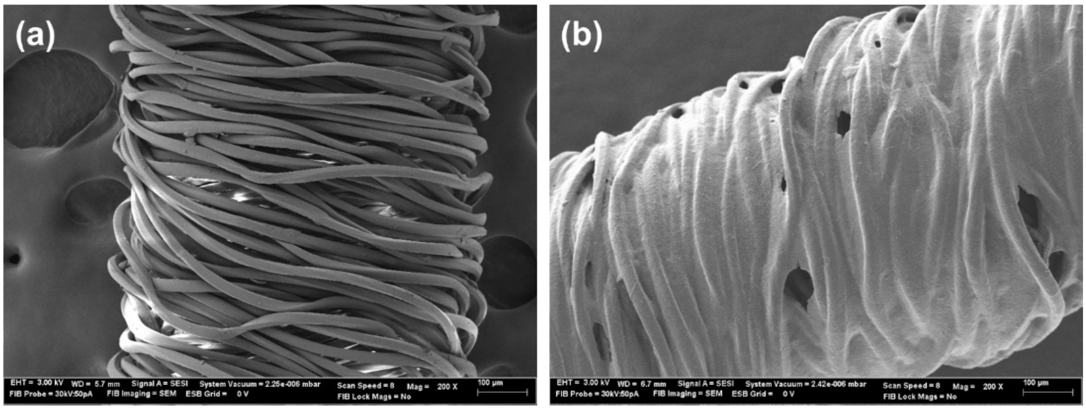

Fig. S1 SEM images of (a) pristine elastic string and (b) CES fiber.

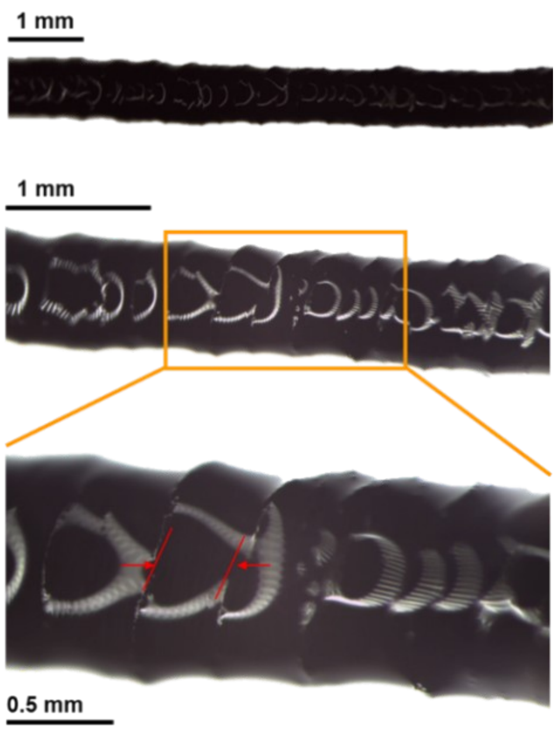

Fig. S2 Optical microscopy images of the CES fiber with PDMS encapsulation.

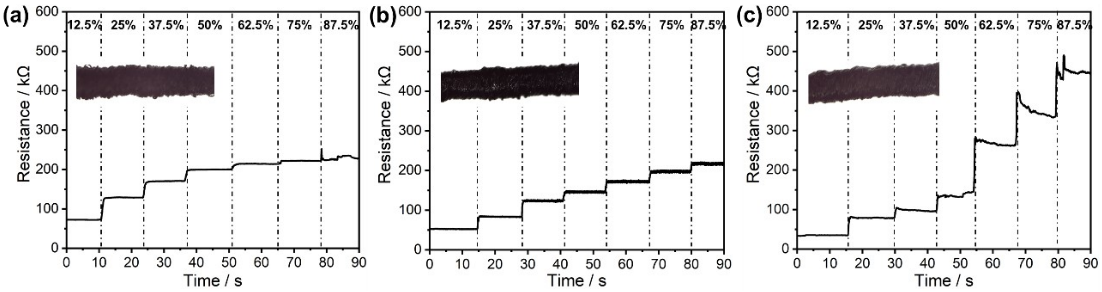

Fig. S3 The resistance responses of different CES sensors under step-wise strain. The amount of CNTs was controlled by different coating times: (a) 1 time, (b) 2 times, and (c) 3 times. After each coating, the CES was dried naturally, followed by the next coating procedure. The resistance responses under successive strain were performed on each sensor in Fig. S3. Progressive responses were observed on all the sensors. The sensing performance improved with the increase of CNTs (wider strain range and more stable responses), while a degraded performance with unstable responses was observed when the amount of CNT was excess. Therefore, the CES prepared with 2 coating times was chosen as the optimal sensor to investigate its performance on human body.

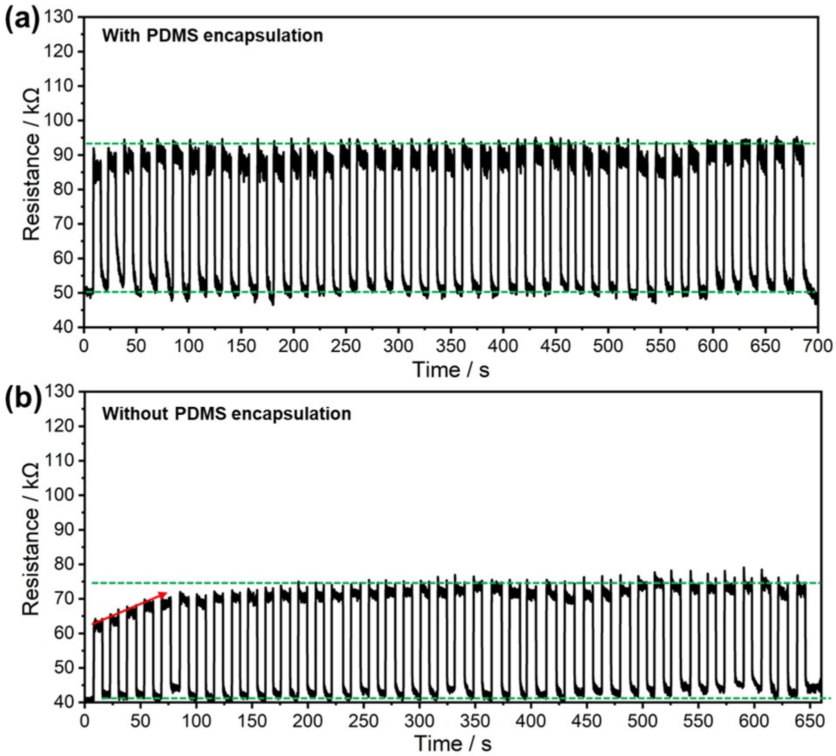

Fig. S4 The influence of PDMS on the stability: resistance responses of the CES sensor (a) with and (b) without PDMS encapsulation under 12.5% strains.

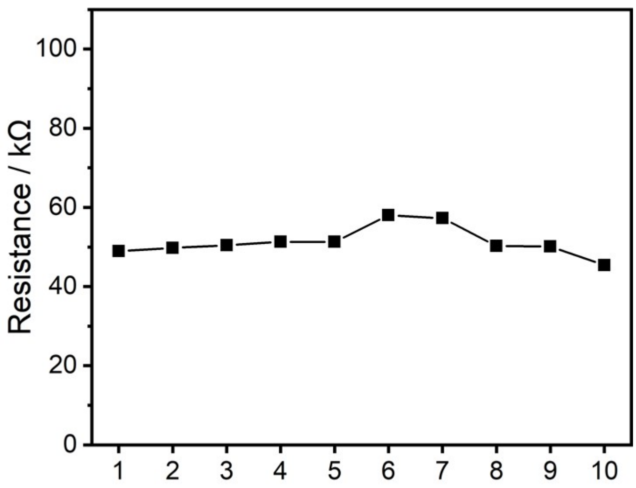

Fig. S5 Initial resistances of 10 individually prepared sensors.