Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

3D Printing of a Self-healing Nanocomposite for Stretchable Sensors

Qinghua Wu[a], *Shibo Zou*[b], *Frédérick P. Gosselin*[b], *Daniel Therriault*[b], *Marie-Claude Heuzey*[a]

[a]Department of Chemical Engineering, Research Center for High Performance Polymer and Composite Systems (CREPEC), Polytechnique Montréal, 2900 Edouard Montpetit Blvd, Montreal, Canada

[b]Laboratory for Multiscale Mechanics (LM2), Department of Mechanical Engineering, Research Center for High Performance Polymer and Composite Systems (CREPEC), Polytechnique Montréal, 2900 Edouard Montpetit Blvd, Montreal, Canada

Supporting Information

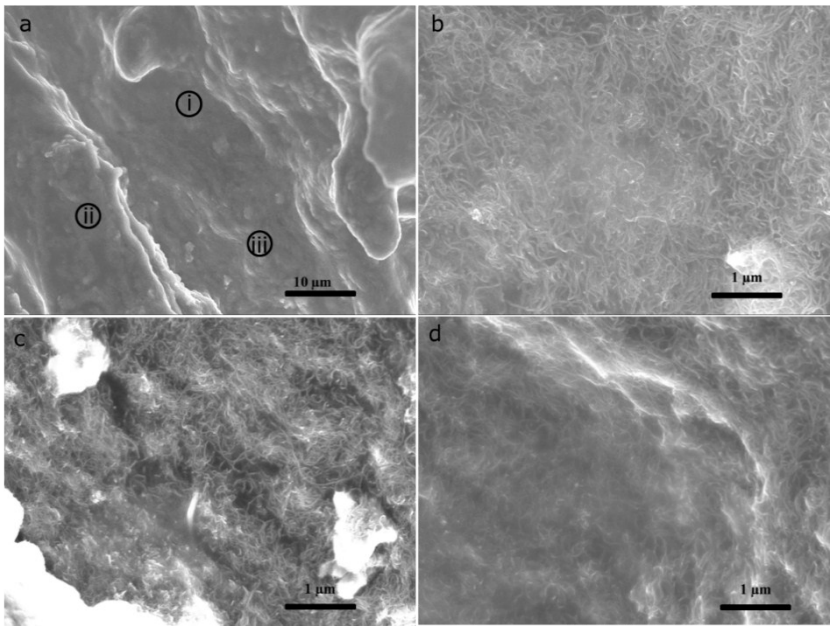

Figure S1. (a) SEM images of CS/CNT nanocomposite (30 wt % CNT) morphology in the cross-section of a CS/CNT fiber. (b), (c) and (d) show CNT homogeneous distribution in the nanocomposite at higher magnification SEM images of the nanocomposite morphology at different positions (i, ii, and iii) in (a).

Table S1. Different patterned CS/CNT fibers were generated by IA3DP (instability assisted 3D printing) through changing speed ratio (V_t/V_p) under the same distance ratio of distance/nozzle diameter (H/D) = 10

Speed ratio (V_t/V_p)	Fiber patterns	
< 1	Break or thin straight fiber	
= 1	Straight fiber	
Slightly larger than 1	Meandering pattern	
1.6 ~ 2.5	Alternating or coiling pattern	
2.5 ~ 3.5	Coiling pattern	
> 3.5	Overlapping pattern	

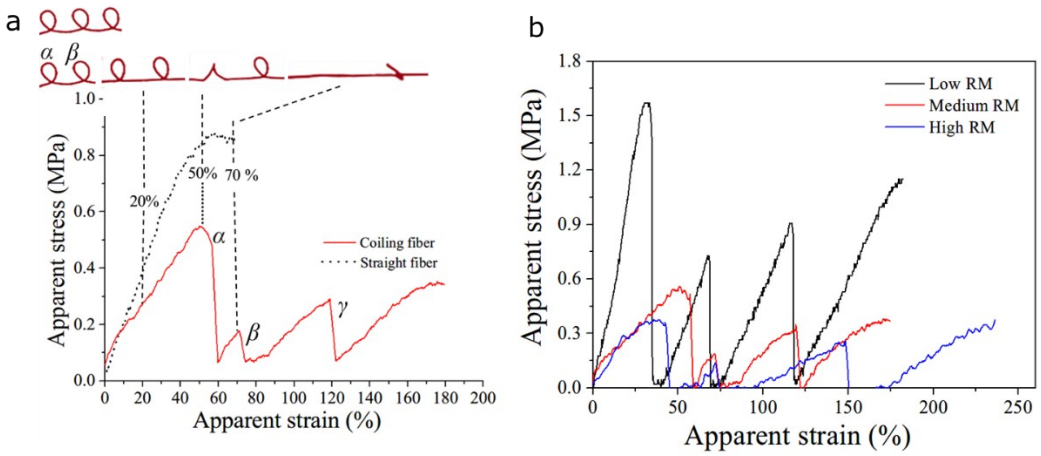

Figure S2. (a) Representative tensile curves of straight and coiling patterned fibers with photographs on the top to show sacrificial bond breakage and hidden length extension of bond α. (b) Typical tensile curves of coiling pattern fibers with different relative

moisture (RM) level of (low RM = 14 %, medium RM = 18 %, high RM = 21 %, *H*/*D* = 10).

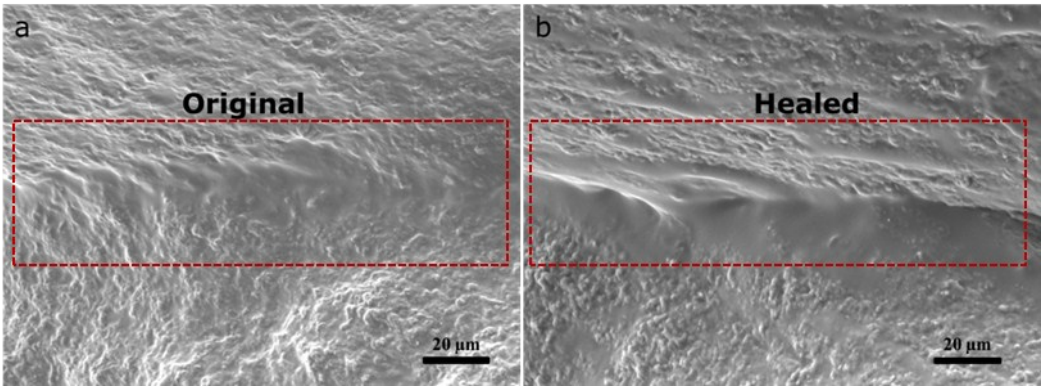

Figure S3. Higher magnification views of (a) original and (b) healed sacrificial bonds of a microstructured fiber. The dotted areas show the edge of the bond formed by connected fibers.

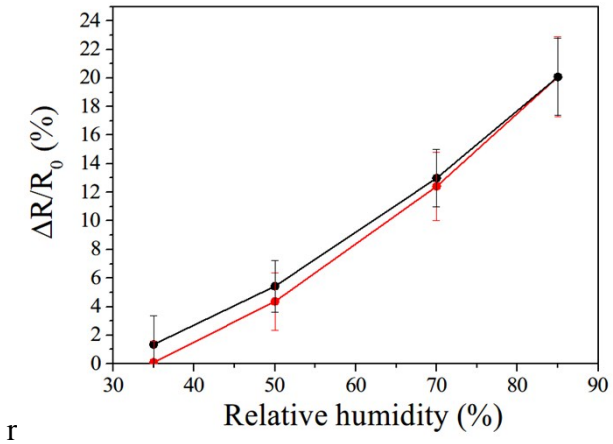

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Figure S4. Relationship between relative humidity (RH) and relative resistance change for a CS/CNT fiber (10 wt % CNT) as a humidity sensor.

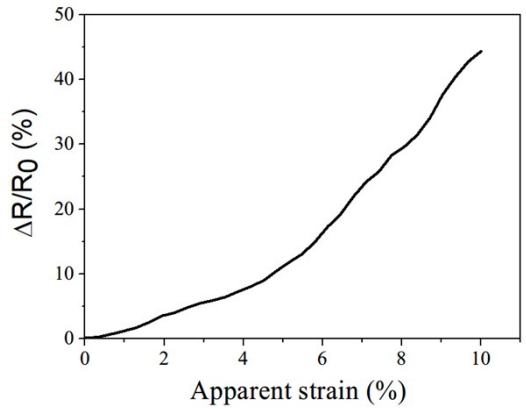

Figure S5. Relative resistance changes of the strain sensor with respect to the apparent strain.

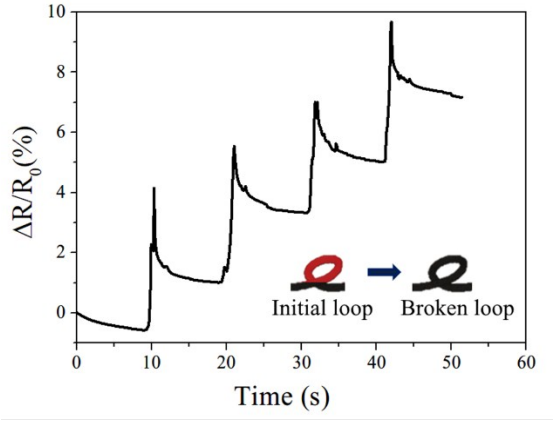

Figure S6. Relative resistance changes of the whole CS/CNT fiber web in response to breaking four bonds. The inset images show top views of an initial loop and the loop after breaking its sacrificial bond and the black curve shows their different electronic pathways by illustrating relative resistance change.

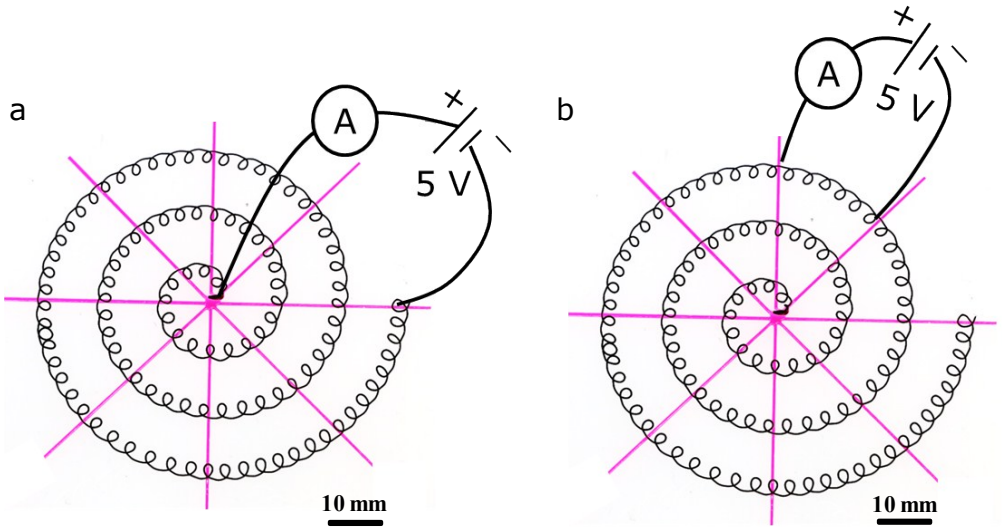

Figure S7. (a) Wiring schematic for measuring the current of one fiber piece in the spider-web-like sensor. (b) Wiring schematic for measuring the current of the whole fiber in the spider-web-like sensor.