Electronic supplementary Information

Coaxial Struts and Microfractured Structures of Compressible Thermoelectric Foams for Self-powered Pressure Sensors

*Jinwoo Oh[a,b], Jong- Ho Kim[c], Kyung Tae Park[a], Kiyoung Jo[a], Jong-Chan Lee[b], Heesuk Kim[a], and Jeong Gon Son[a,]**

a. Photo-electronic Hybrids Research Center, Korea Institute of Science and Technology, Seoul 02792, Republic of Korea

b. School of Chemical & Biological Engineering, Seoul National University, Seoul, 08826, Republic of Korea

c. Center for Mechanical Metrology, Korea Research Institute of Standards and Science, Daejeon 34113, Republic of Korea

E-mail: jgson@kist.re.kr

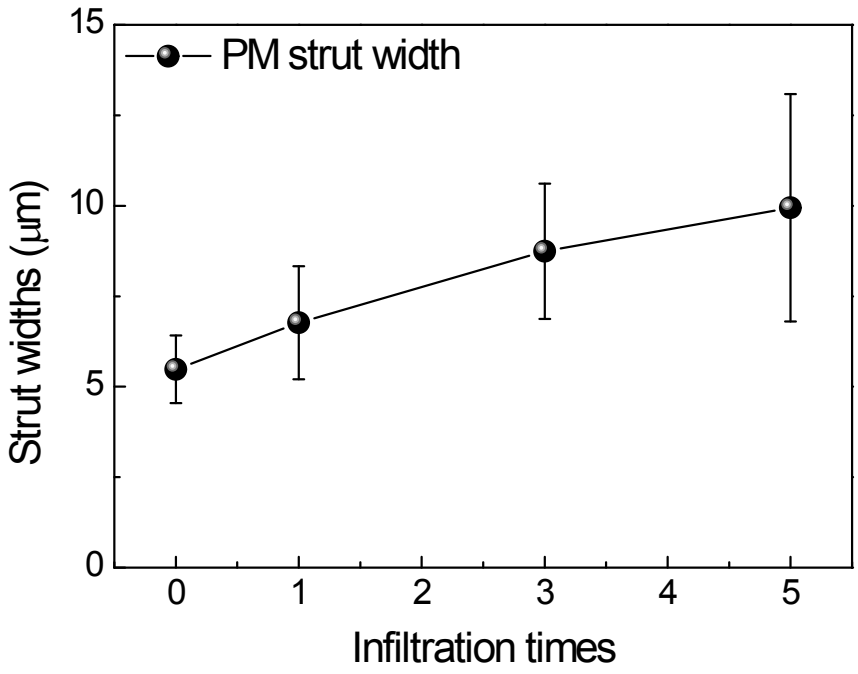

Figure S1. The strut widths as a function of PEDOT:PSS infiltration times. The strut widths increase linearly with infiltration numbers.

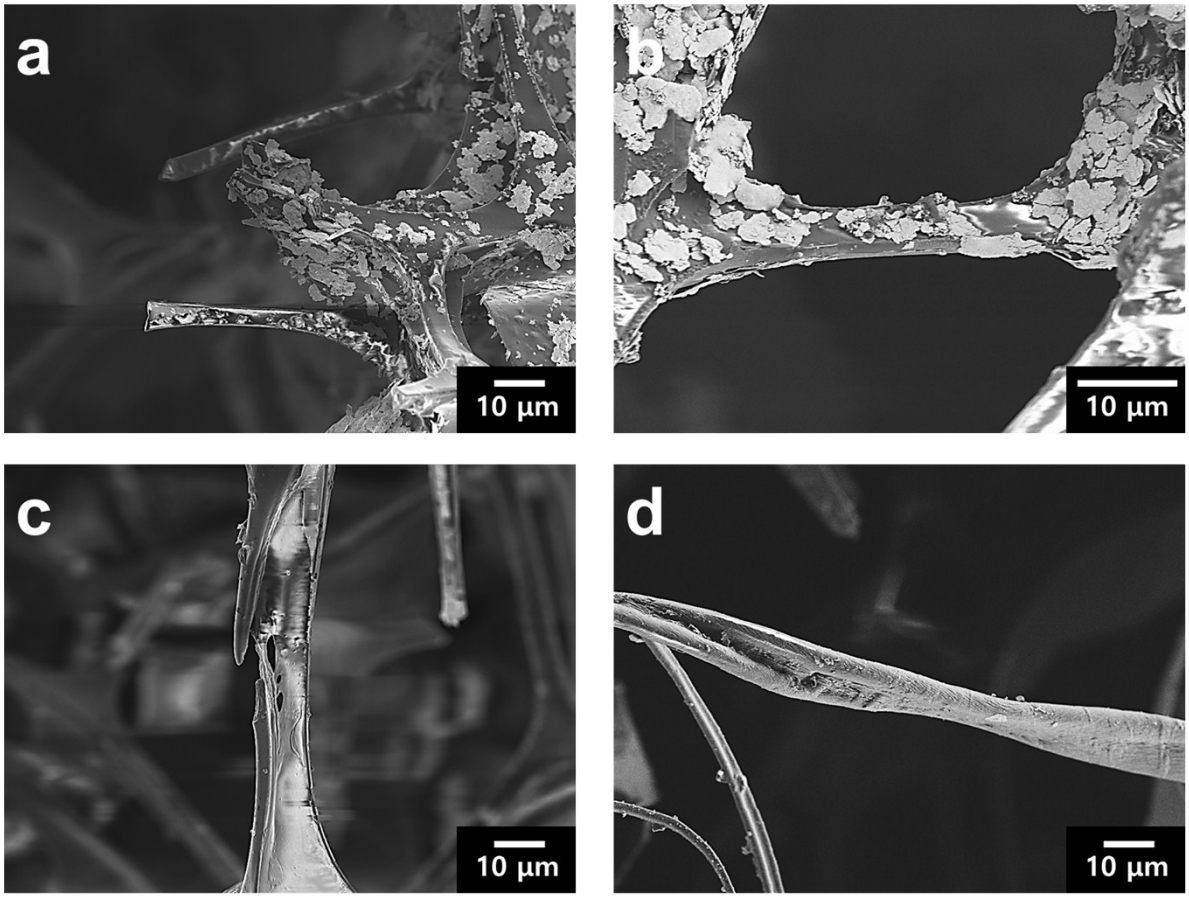

Figure S2. SEM image of PM (a, b) and SPM (c, d) after repeated pressure loading and unloading test. In PM, delaminated powdery PEDOT:PSS from the MF skeleton is observed (a, b). On the other hand, in SPM, PEDOT:PSS powder is not observed hence the particle is stuck to SEBS sheath. Moreover, SEBS mechanically enhances of the SPM by holding the structure after pressure (c).

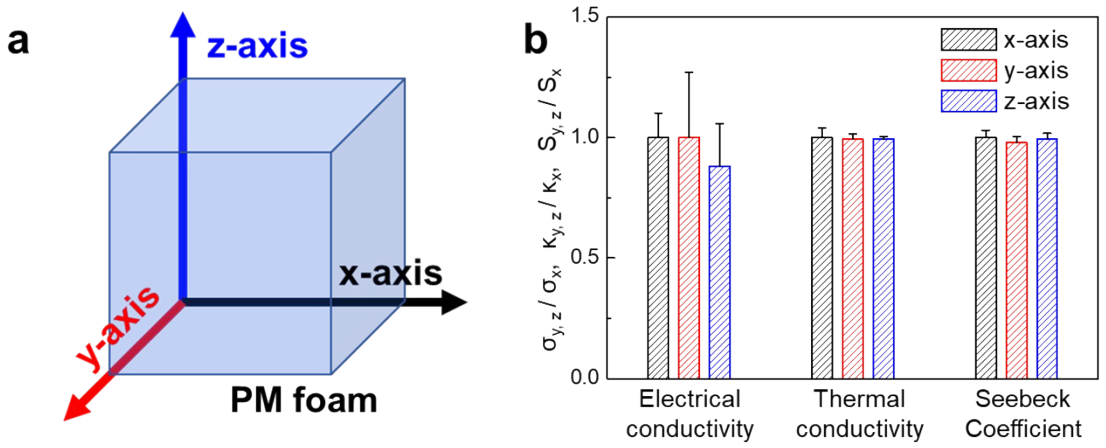

Figure S3. (a) Schematic image of PM foam with measurement direction, (b) relative electrical conducitivity, thermal conductivity and Seebeck coefficient against to horizontal direction (x-axis).

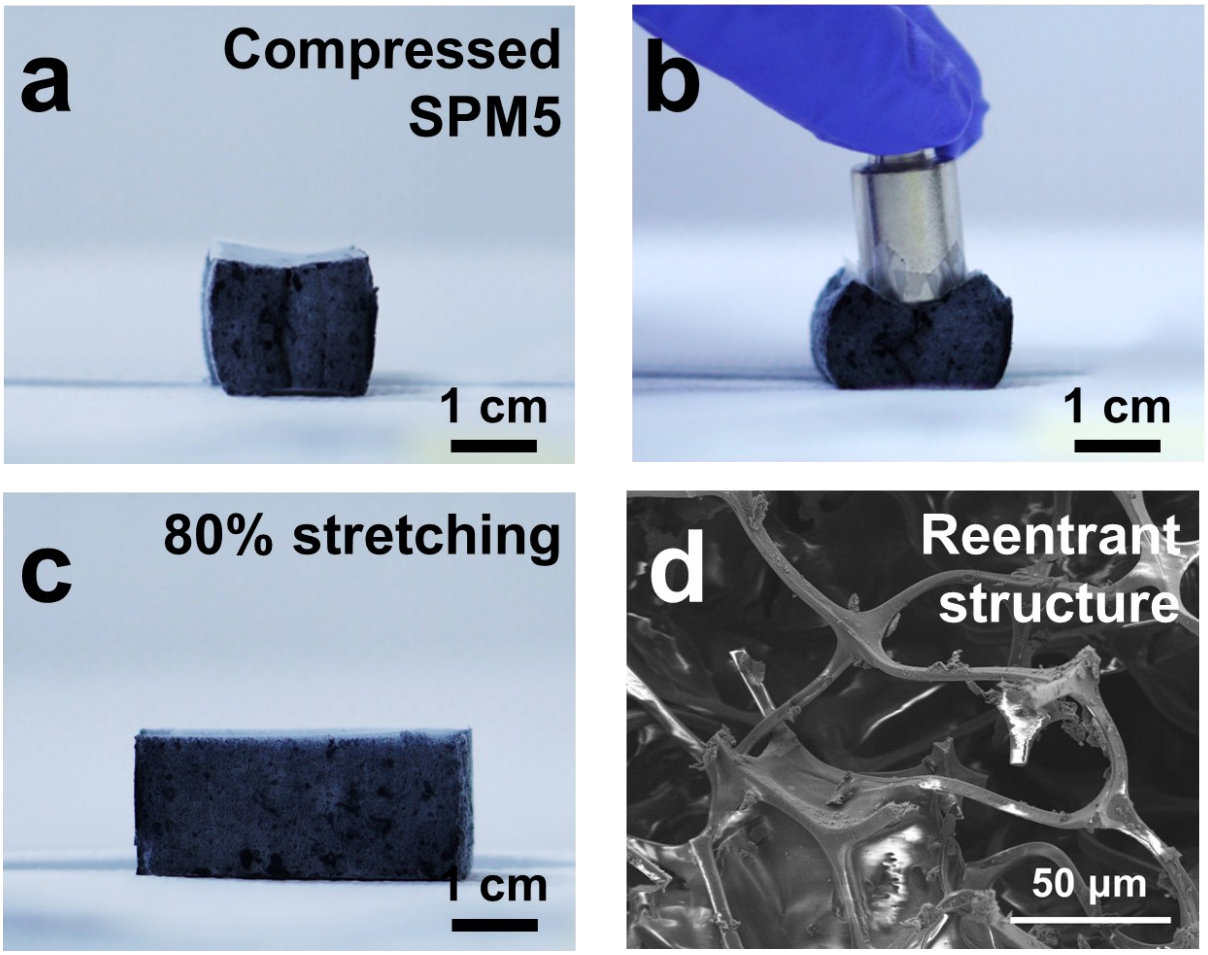

Figure S4. Digital image of SPM5 with lateral compression. (a) Laterally compressed SPM5. (b) Deformed SPM5 under vertical pressure. (c) Stretched SPM5 (d) SEM image of compressed SPM5.

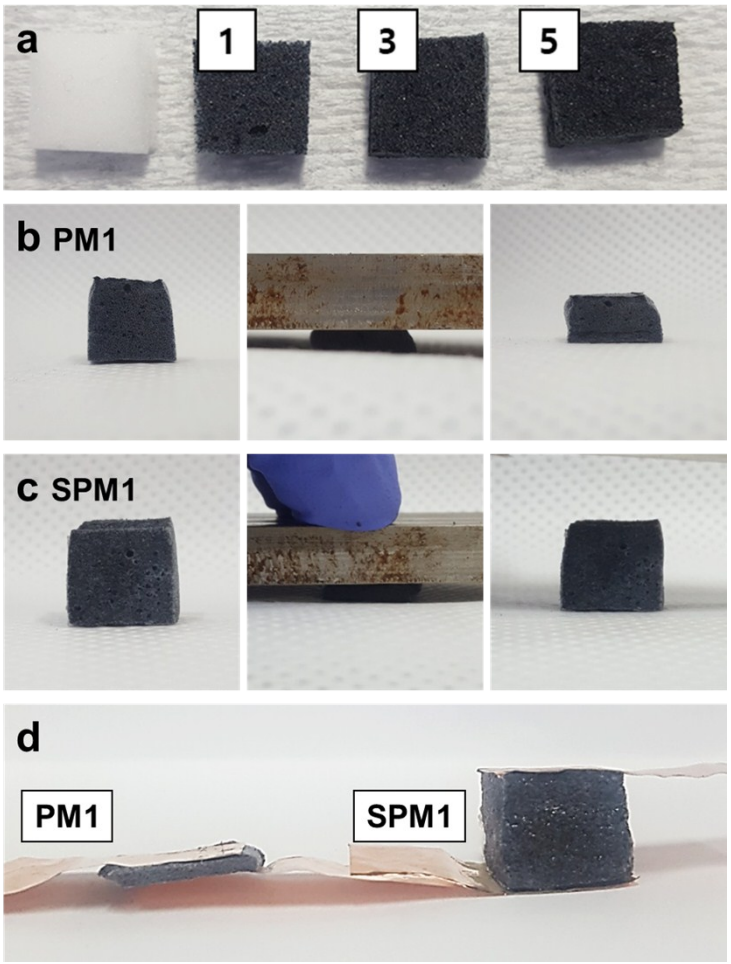

Figure S5. Digital images of PM and SPM. (a) The digital image of MF and PM with different infiltration number. As the loading contents of PEDOT:PSS increases, the color of PM is darker. (b and c) Digital image of PM1 and SPM1 before and after loading weight. Though small weight (200 g) is loaded to the foams, PM1 cannot recover the original shape quickly, on the other hand, SPM1 can recover the shape right after removing the pressure. (d) The digital image of PM1 and SPM1 after 95 % compression with strong pressure[1]. PM1 do not recover the shape meanwhile SPM1 recover the shape

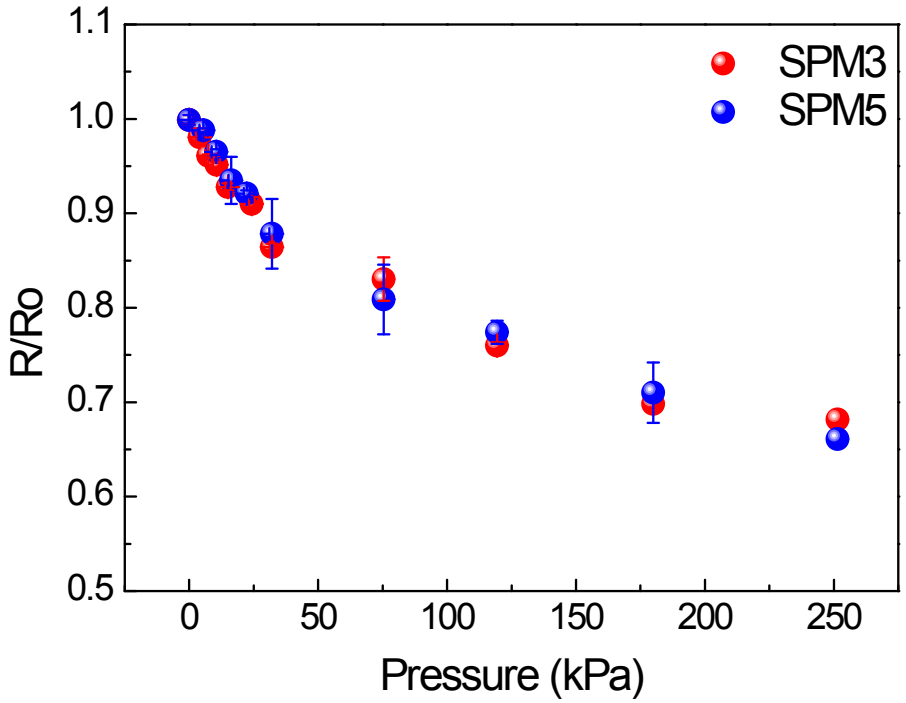

Figure S6. Change in the electrical resistance of 95%-compressed SPM foams with different thickness of PEDOT:PSS layer (SPM3 and SPM5) as a function of applied pressure.

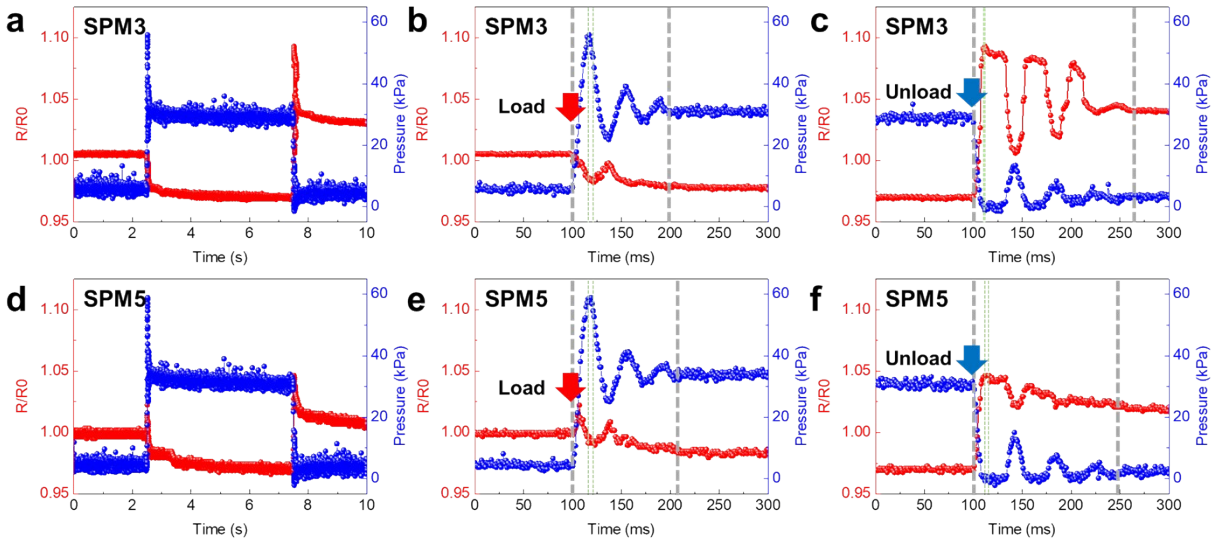

Figure S7. Pressure-sensing performance of 95%-compressed SPM3 and SPM5 foams. The resistnace difference versus time for (a-c) SPM3 and (d-f) SPM5 with 35 kPa for the observation of response and recovery behaviors.

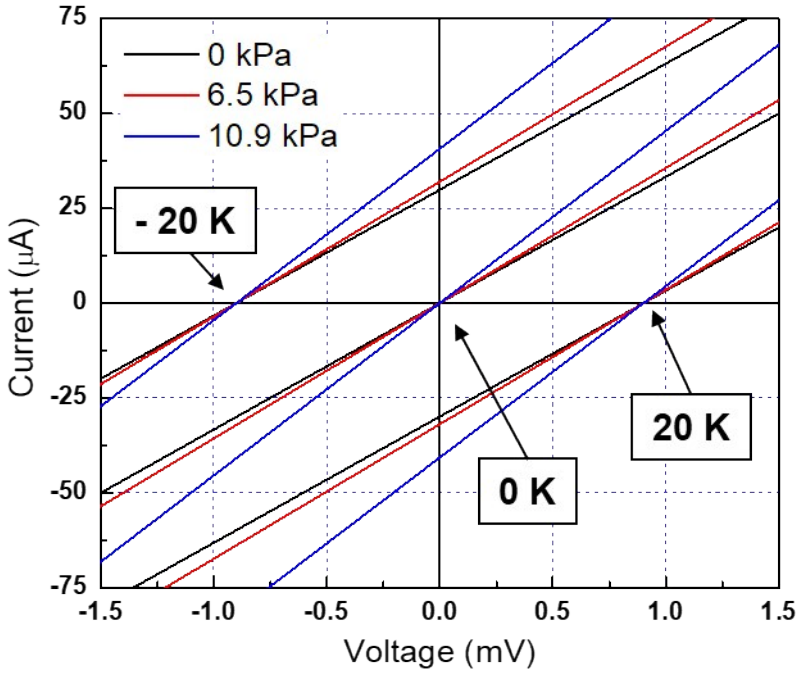

Figure S8. I-V curves of the SPM-based TEG as a function of temperature difference and pressure. The T0 is 0 K.

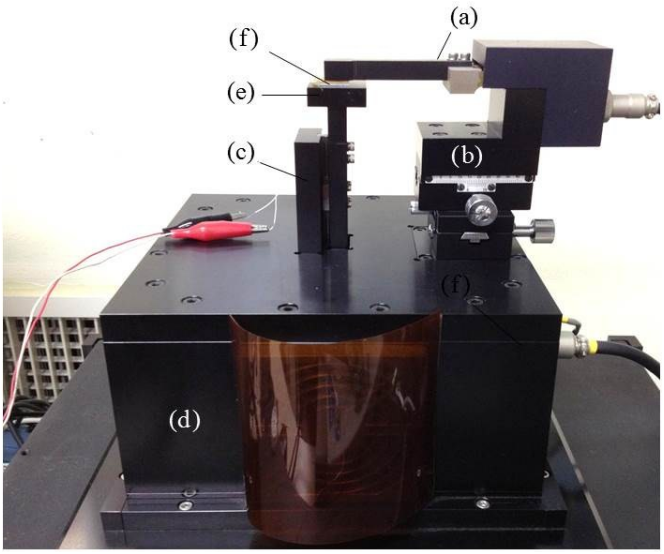

Figure S9. Fatigue test setup with moving coil linear stage to evaluate the durability of the sensor: (a) cantilever type load-cell, (b) positioning stage, (c) linear-guide, (d) actuator part composed of field magnet and moving bobbin with coil, (e) jig and flat plate, and (f) distributed force sensor.

Reference

1 H. Bin Yao, J. Ge, C. F. Wang, X. Wang, W. Hu, Z. J. Zheng, Y. Ni and S. H. Yu, *Adv. Mater.*, 2013, **25**, 6692.