

ADVANCED FUNCTIONAL MATERIALS

Supporting Information

for *Adv. Funct. Mater.*, DOI: 10.1002/adfm.201602624

Mesoporous Piezoelectric Polymer Composite Films with
Tunable Mechanical Modulus for Harvesting Energy from
Liquid Pressure Fluctuation

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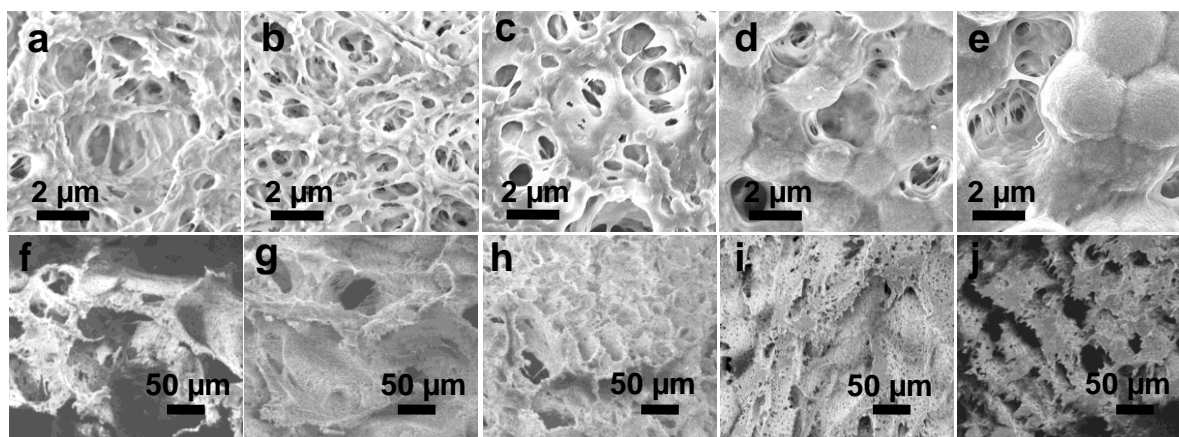


Figure S1. (a-e) SEM images of mesoporous PVDF films with volume PVDF fractions of 3% (a), 4% (b), 6% (c), 9% (d), and 18% (e). (f-j) Corresponding low-magnification SEM images of mesoporous PVDF films with volume PVDF fractions of 3% (f), 4% (g), 6% (h), 9% (i), and 18% (j).

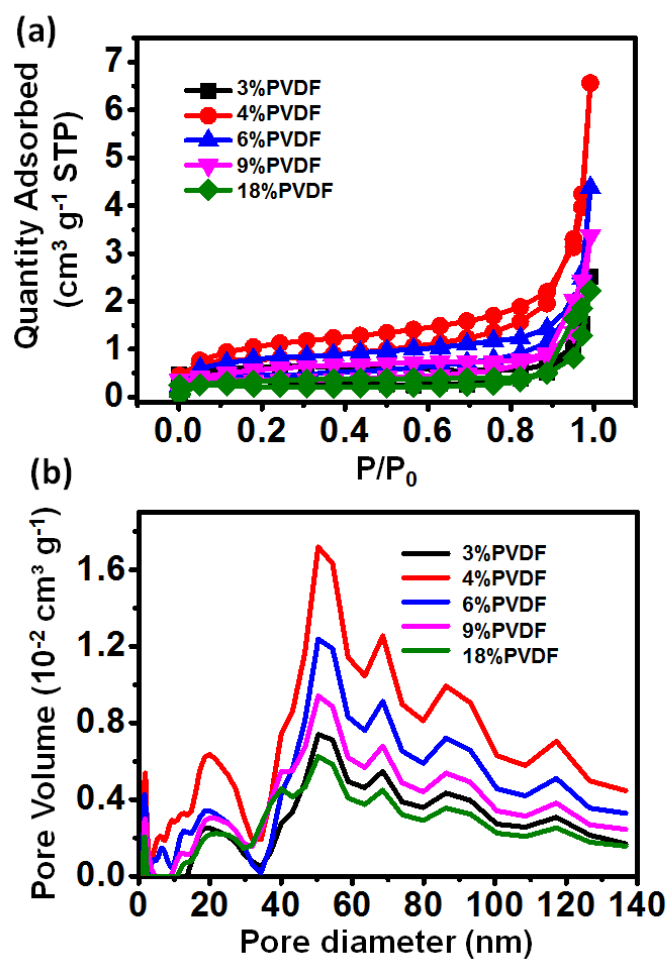


Figure S2. (a) Nitrogen adsorption–desorption isotherms measured from the mesoporous PVDF samples with different PVDF volume fraction. (b) Corresponding pore size distributions calculated by DFT from isotherms.

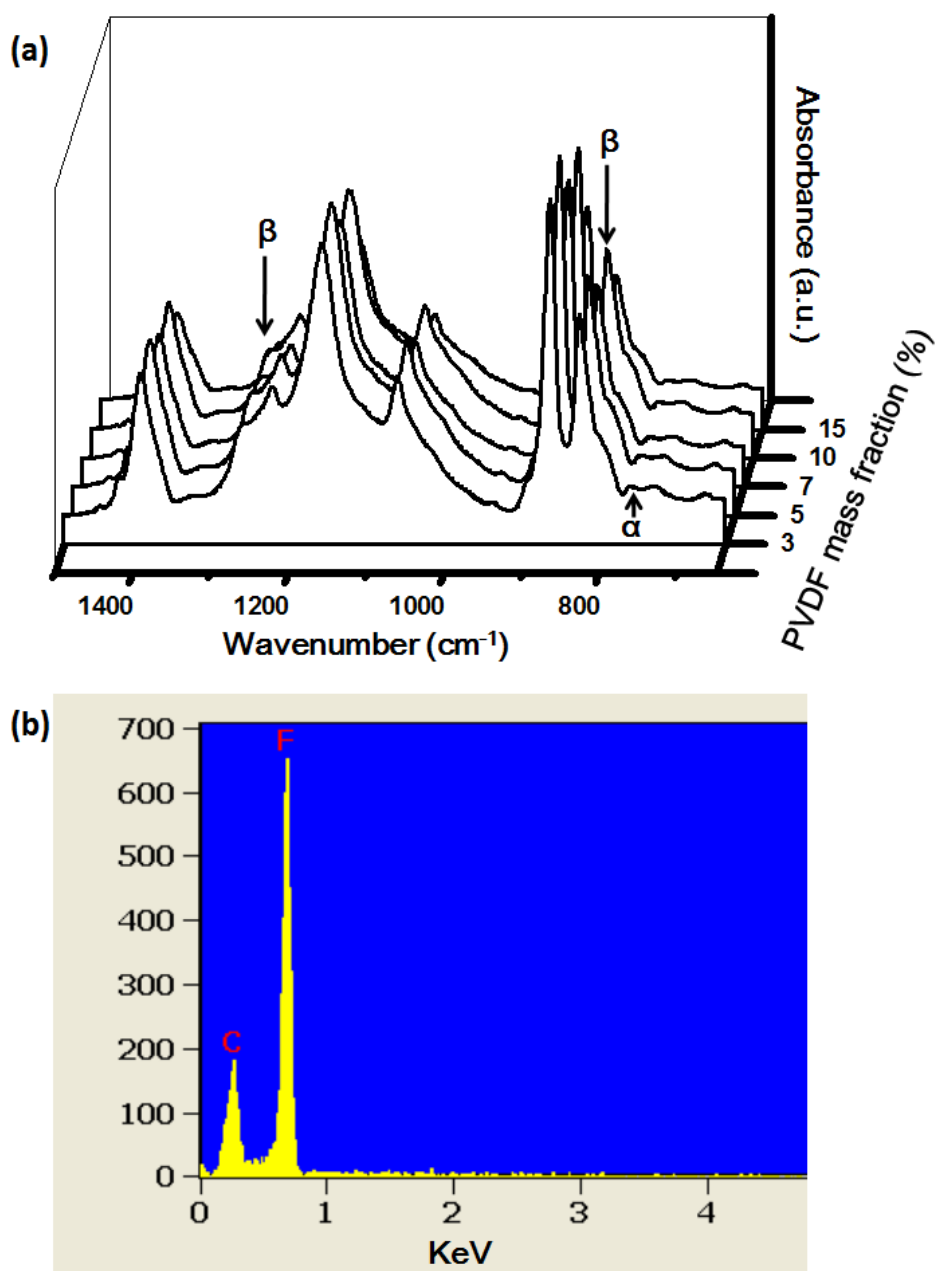


Figure S3. (a) FTIR of mesoporous PVDF films with different PVDF volume fraction. (b) EDS of a mesoporous PVDF film showing no signal of other elements besides C and F.

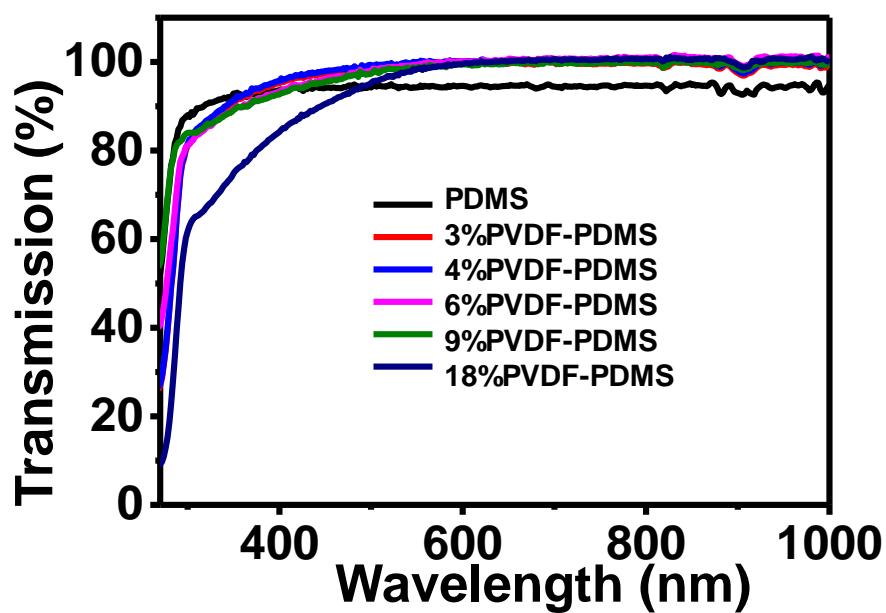


Figure S4. Transmittance of pure PDMS and PVDF-PDMS composite samples with different PVDF volume fraction.



Figure S5. Dumbbell-shaped PVDF-PDMS composite sample for tensile stress-strain test.



Figure S6. Disk-shaped PVDF-PDMS composite sample for compressive stress-strain test.

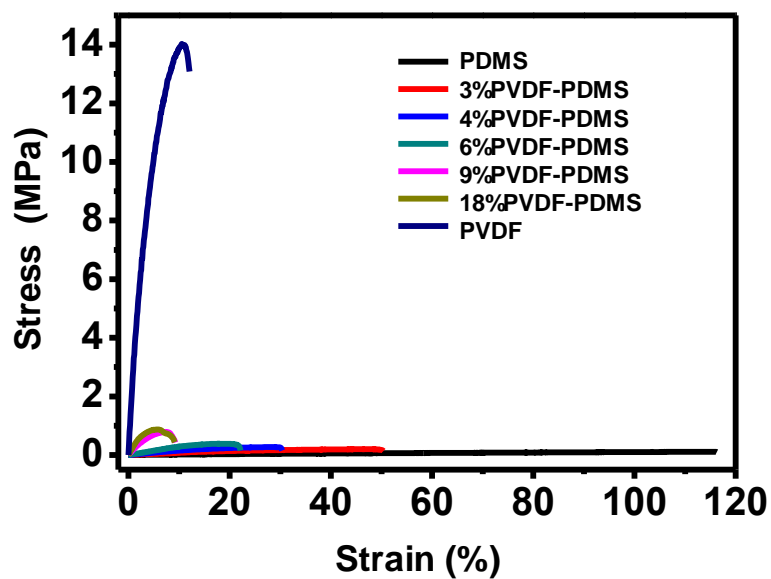


Figure S7. Tensile stress-strain curves including pure PDMS, PVDF and PVDF-PDMS composite films with different PVDF volume fraction, showing significant different mechanical property of pure PVDF compared to the composites.

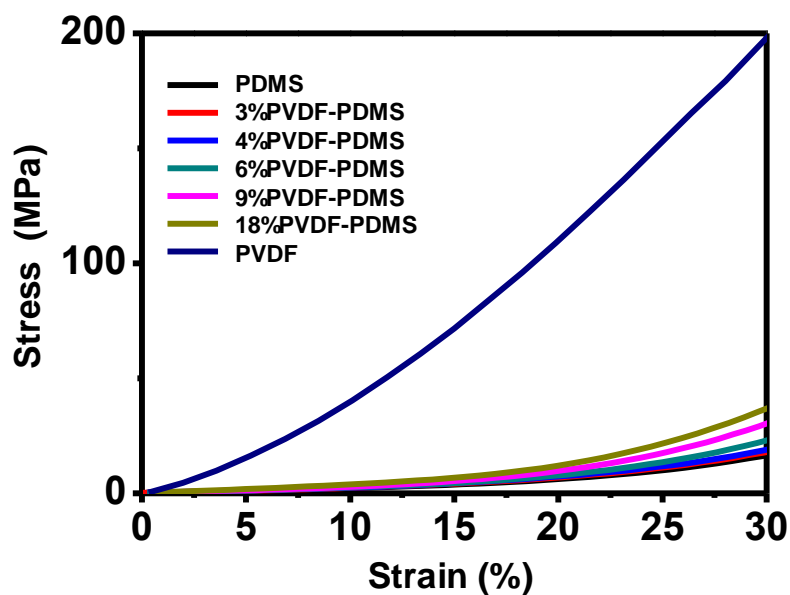


Figure S8. Compressive stress-strain curves including pure PDMS, PVDF and PVDF-PDMS composite films with different PVDF volume fraction, showing significant different mechanical property of pure PVDF compared to the composites.

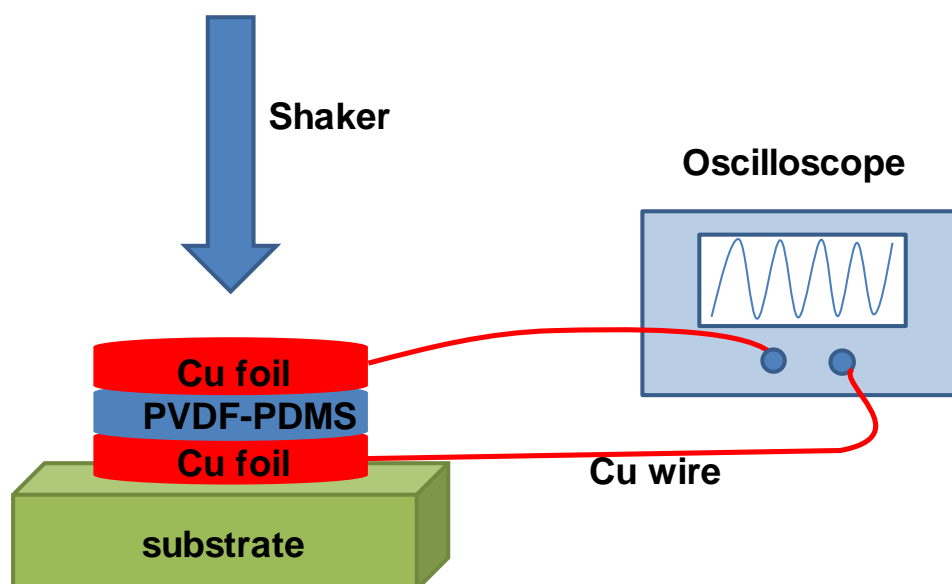


Figure S9. Schematic setup of testing the piezoelectric output from PVDF-PDMS NG slabs under compressive strains.

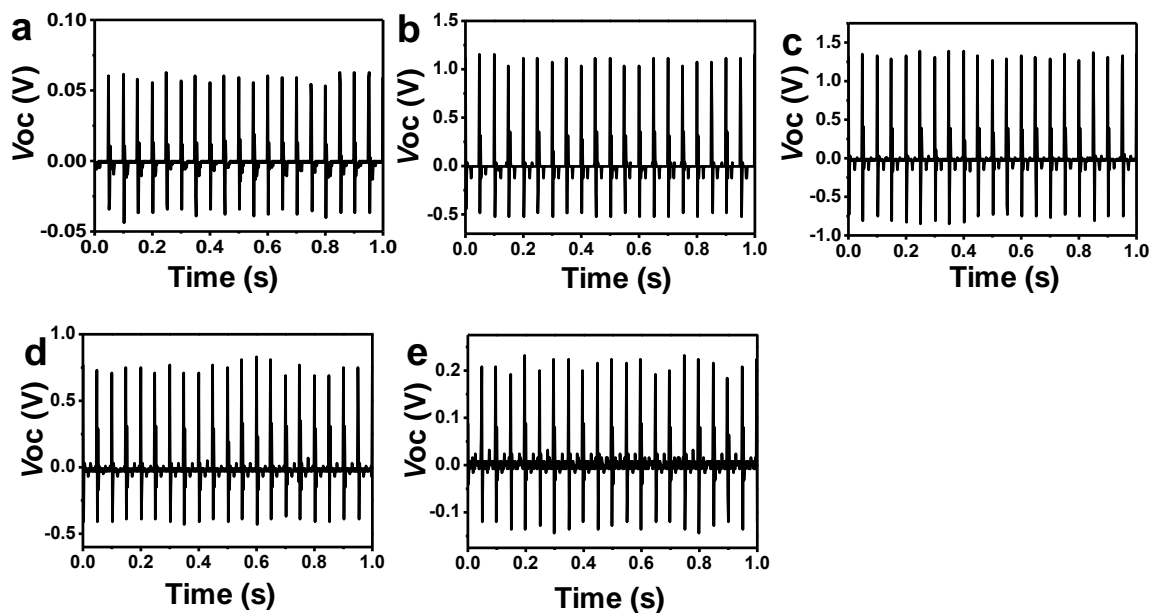


Figure S10. Piezoelectric voltage output profile of PVDF-PDMS composite NG films with different PVDF volume fraction. (a) 0% PVDF; (b) 3% PVDF; (c) 6% PVDF; (d) 9% PVDF; (e) 18%.

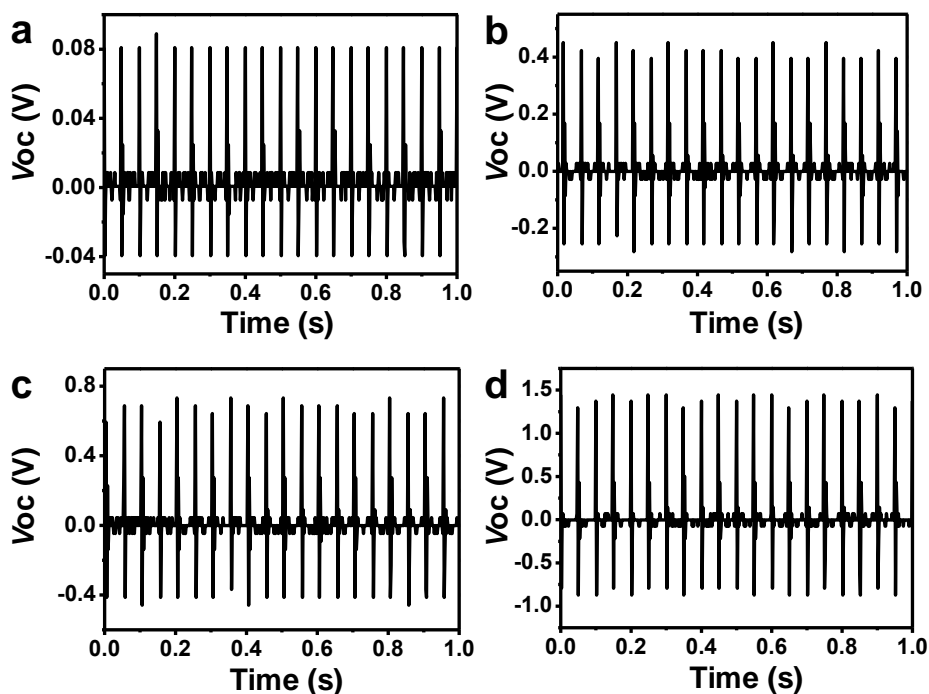


Figure S11. Piezoelectric voltage output profile of PVDF-PDMS composite NG films with 4% PVDF volume fraction under different compressive forces. (a) 0.52 N; (b) 1.84 N; (c) 2.75 N; (d) 4.71 N.

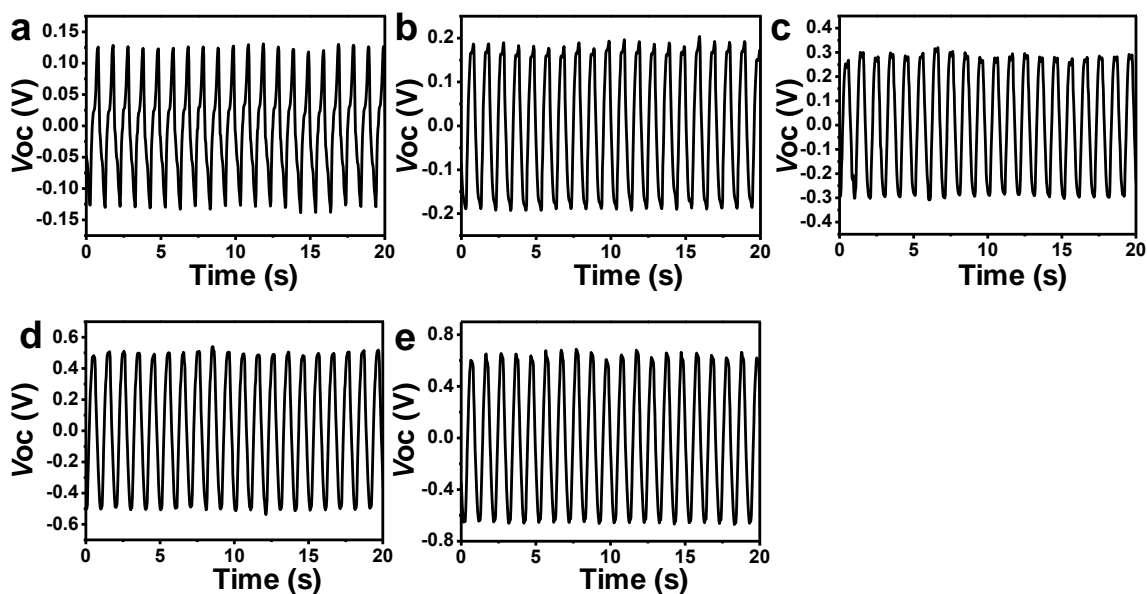


Figure S12. Piezoelectric voltage output profile obtained from an imbedded PVDF-PDMS composite NG in the artificial artery system under different internal pressure differences. (a) 60 kPa; (b) 83 kPa; (c) 113 kPa; (d) 132 kPa; (e) 158 kPa.

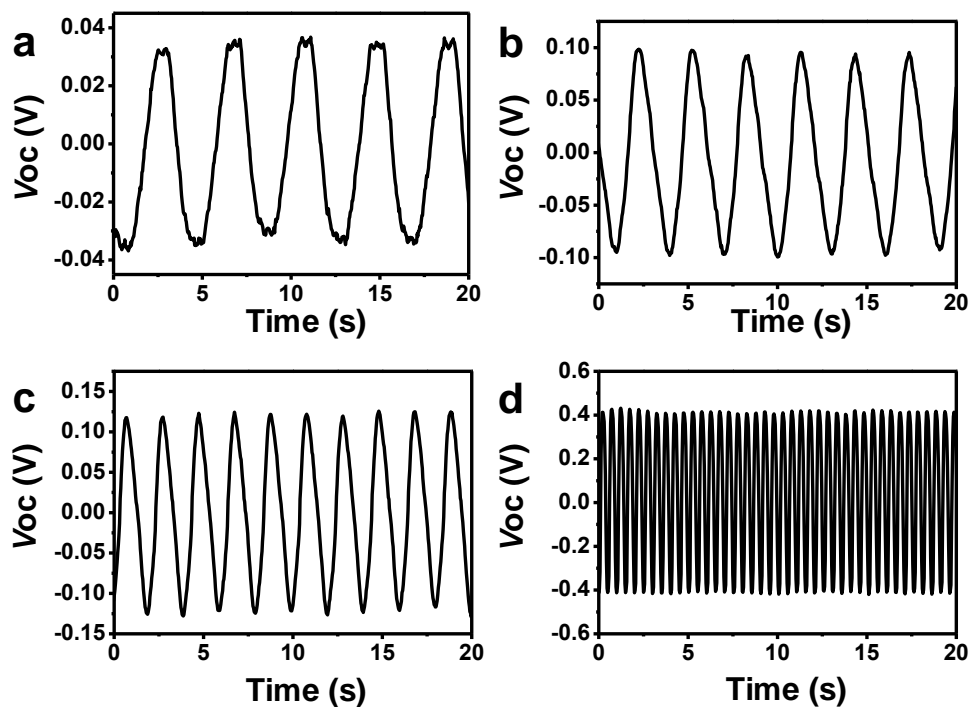


Figure S13. Piezoelectric voltage output profile obtained from an imbedded PVDF-PDMS composite NG in the artificial artery system under internal pressure difference of 113 kPa at different pressure variation frequencies. (a) 15 min^{-1} ; (b) 20 min^{-1} ; (c) 30 min^{-1} ; (d) 120 min^{-1} .

Supporting videos:

S1: Operation of the artificial artery system under periodic internal pressure fluctuation.

S2: Piezoelectric voltage generation from the artificial artery system.