

Supporting Information

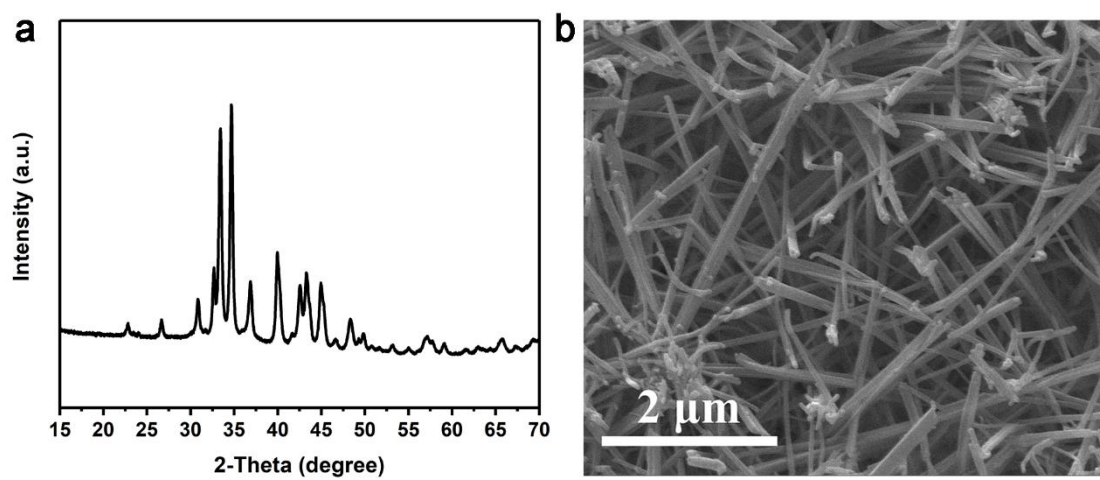
# A Biomimetic Approach to Facilitate High Filler Content in Free-Standing and Flexible Thermoelectric Polymer Composite Films Based on PVDF and Ag<sub>2</sub>Se Nanowires

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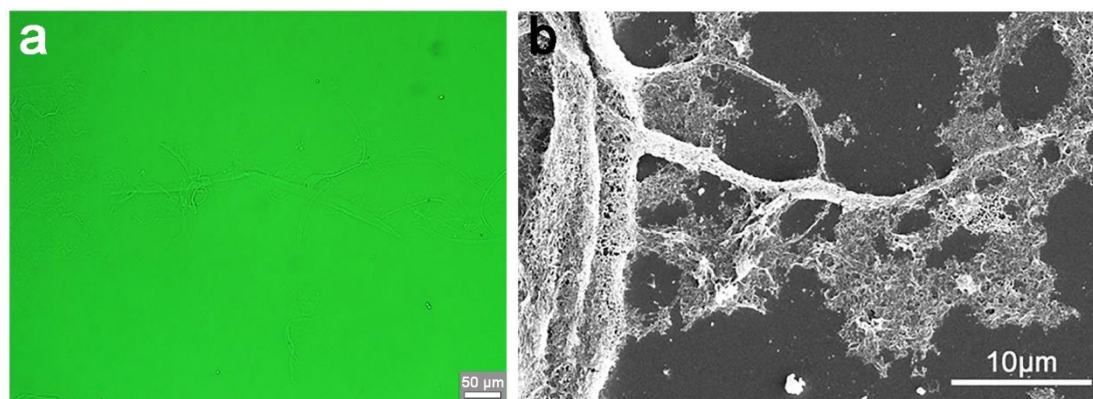
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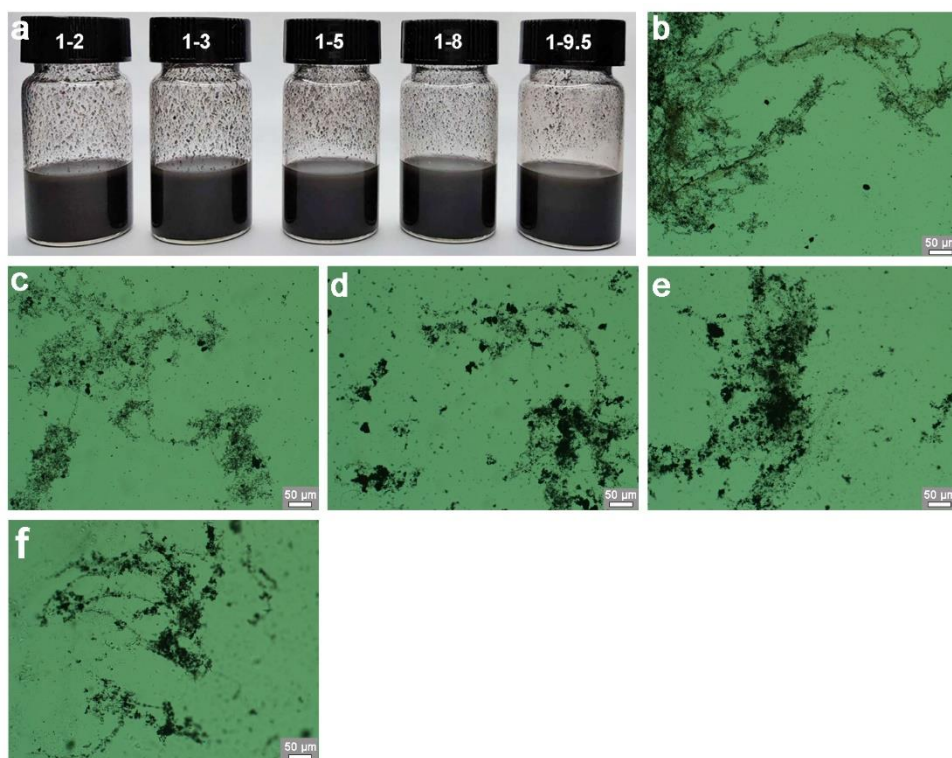
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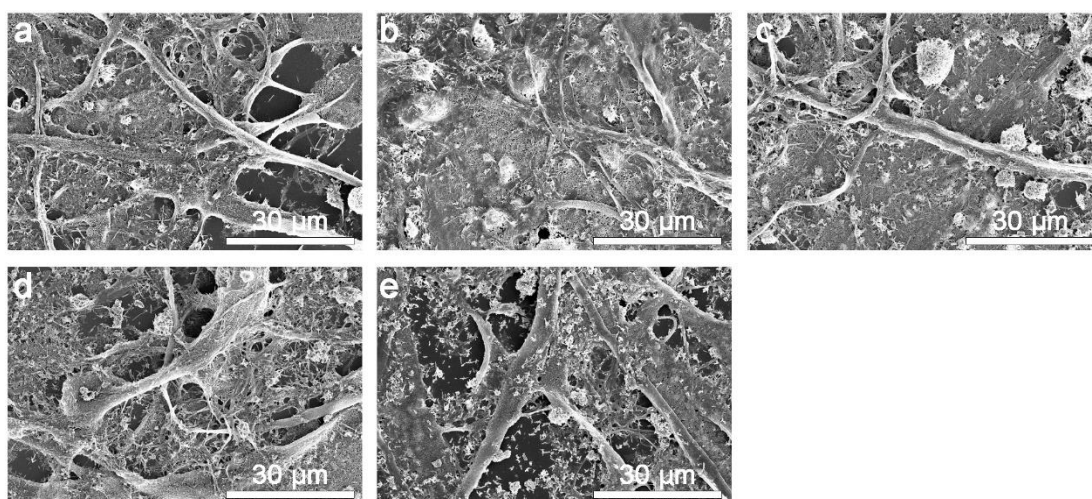
**Figure S1.** XRD pattern and SEM image of  $\text{Ag}_2\text{Se}$  NWs.



**Figure S2.** Optical microscopy and SEM image of PVDF dendricolloids.

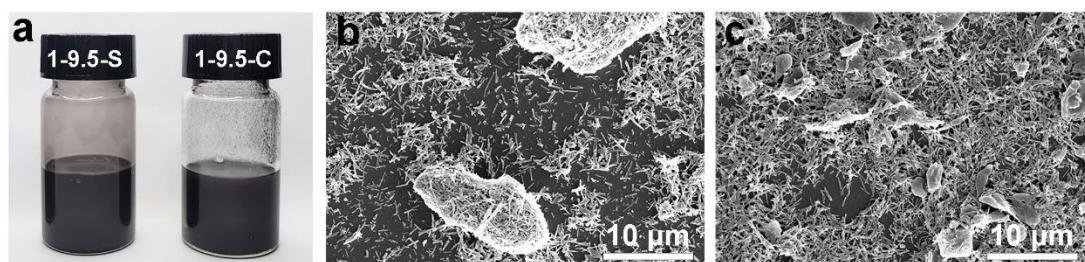


**Figure S3.** Digital photos (a) and optical microscopy of PVDF/Ag<sub>2</sub>Se composite dispersion samples 1-2 (b), 1-3 (c), 1-5 (d), 1-8 (e) and 1-9.5 (f).

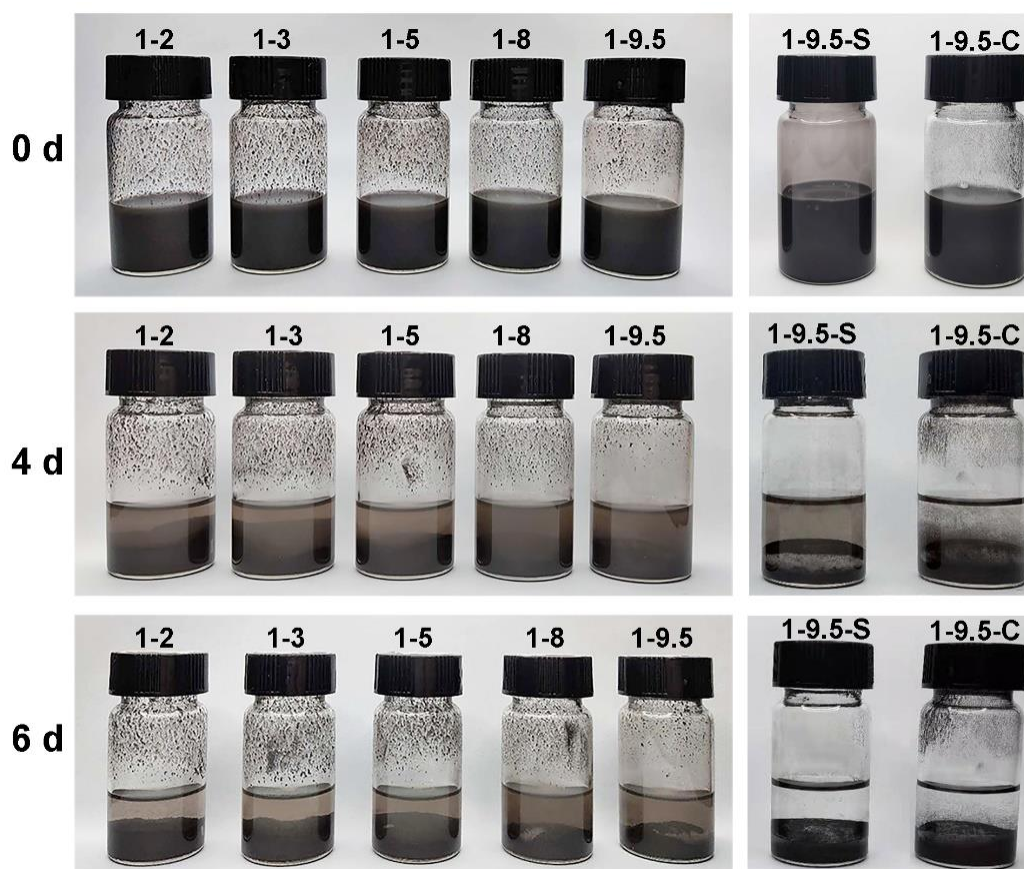


**Figure S4.** SEM images of PVDF/Ag<sub>2</sub>Se composite dispersion samples 1-2 (a), 1-3 (b), 1-5 (c), 1-8 (d), 1-9.5 (e).

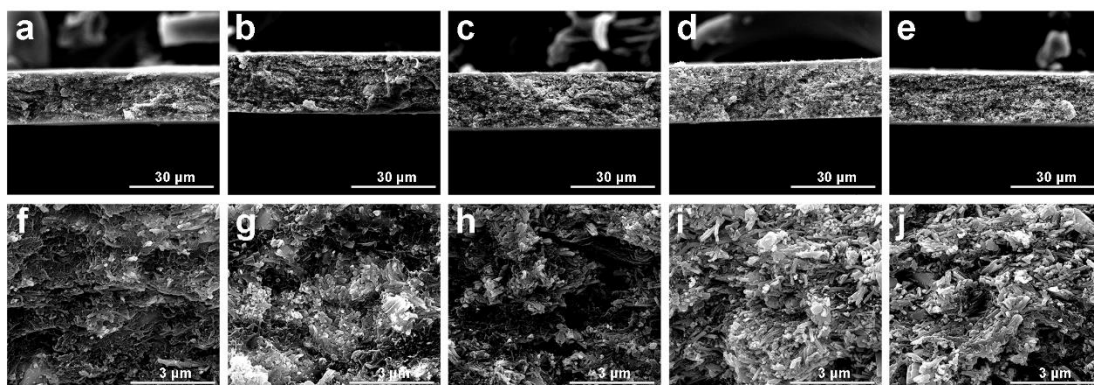




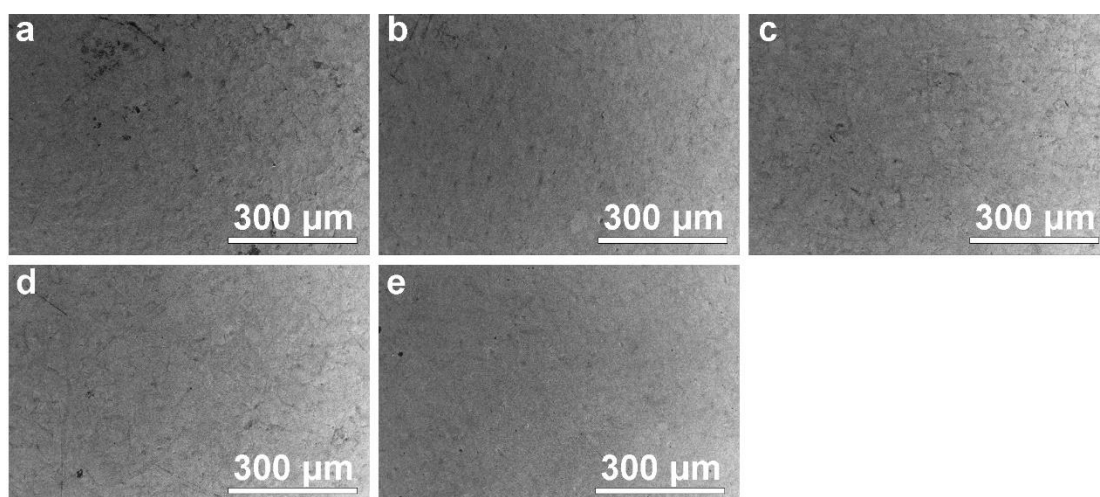
**Figure S5.** Digital photos (a) and SEM images of sample 1-9.5-S (b) and 1-9.5-C (c).



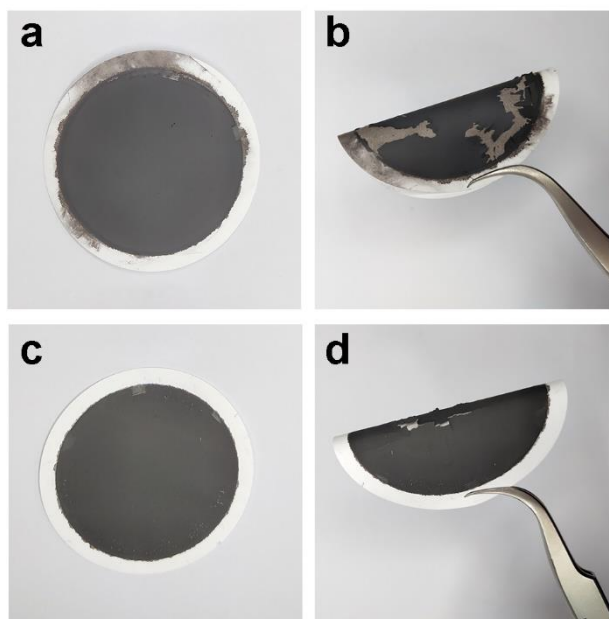
**Figure S6.** Digital photos of the PVDF/Ag<sub>2</sub>Se composite suspension 1-2, 1-3, 1-5, 1-8, 1-9.5, 1-9.5-S and 1-9.5-C (in different columns) originally, after four days and six days, respectively.



**Figure S7.** Fraction SEM images of PVDF/Ag<sub>2</sub>Se composite films samples 1-2 (a, f), 1-3 (b, g), 1-5 (c, h), 1-8 (d, i) and 1-9.5 (e, j) with different magnification.



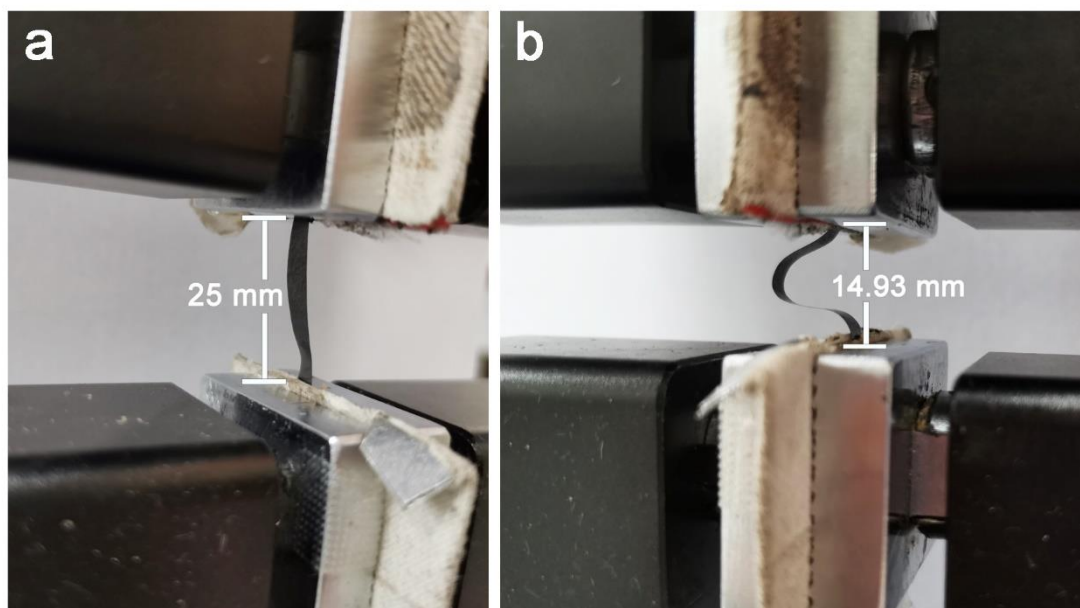
**Figure S8.** SEM images of PVDF/Ag<sub>2</sub>Se composite films surface for sample 1-2 (a), 1-3 (b), 1-5 (c), 1-8 (d) and 1-9.5 (e).



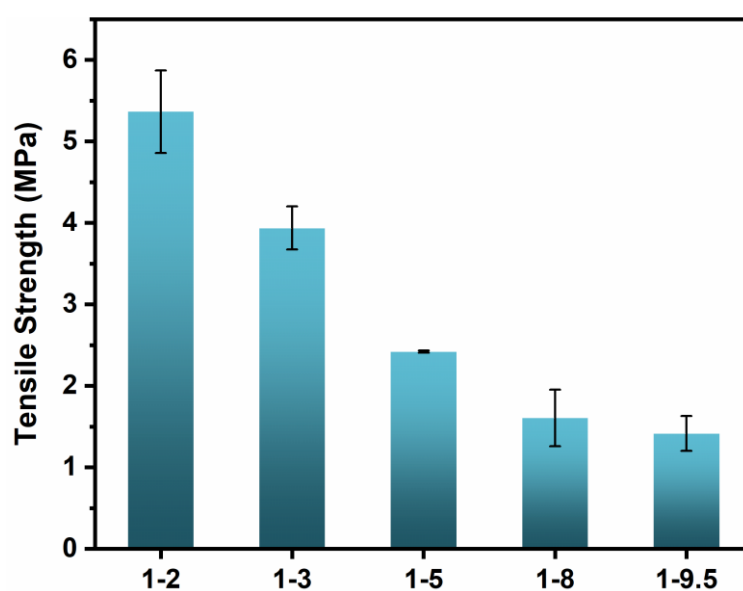
**Figure S9.** Digital photos of PVDF/Ag<sub>2</sub>Se films fabricated from sample 1-9.5-S (a, b) and 1-9.5-C (c, d).

**Table S1.** Specific heat capacity, thermal diffusivity, experimental density and theoretical density of PVDF/Ag<sub>2</sub>Se composite films.

Sample	Specific heat capacity (J g <sup>-1</sup> K <sup>-1</sup> )	In-plane thermal diffusivity (mm <sup>2</sup> s <sup>-1</sup> )	Out-of-Plane thermal diffusivity (mm <sup>2</sup> s <sup>-1</sup> )	Experimental Density (g cm <sup>-3</sup> )	Theoretical Density (g cm <sup>-3</sup> )
1-2	0.5947	3.593±0.141	0.0322±0.0112	3.27	3.73
1-3	0.4965	3.676±0.170	0.0334±0.0050	3.73	4.32
1-5	0.3983	4.343±0.084	0.0390±0.0057	4.04	5.13
1-8	0.3329	4.730±0.103	0.0470±0.0057	4.47	5.86
1-9.5	0.3142	4.719±0.114	0.0460±0.0081	4.82	6.13



**Figure S10.** Digital photos of a sample 1-9.5 strip (3 mm in width) before (a) and after (b) bending to 40% strain.



**Figure S11.** Tensile strength of PVDF/Ag<sub>2</sub>Se composite films at room temperature.