Supplementary Information

Mechanical Energy Harvester Based on Cashmere Fibers

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Figure S1. Alternating $V_{oc}$ and $I_{sc}$ signal of Pristine cashmere TENG.
Figure S2. FT-IR spectra of cashmere after solvent treatment.
Figure S3. XPS full scan spectra of cashmere. (a) Pristine. (b) PSS-T. All three cashmere samples presented peaks of C, O and N, being the most predominant compositional elements of cashmere. While the peak of S was not detected which could be due to its relatively low content in the cashmere fiber. The ratio of C, O, and N for pristine cashmere is 67.2, 32.2 and 0.6, respectively, similar to that of PSS-T and T20-T cashmere. This verifies that PSS and T20 treatment has no impact on the fiber’s elemental composition. Besides, the presence of Si element confirms the presence of silicone on fiber surface.
**Figure S4.** EDX spectra of cashmere fibers. (a) Pristine. (b) Ethanol-T. (c) Water-T. (d) PSS-T. Insets show the elemental compositions of the fibers after treatment.
Figure S5. SEM images of cashmere fibers. (a) Pristine. (b) Ethanol-T. (c) Water-T. (d) PSS-T. (Scale bar: 10 µm)
Table S1. Mechanical property of cashmere fabric before and after solvent treatment

<table>
<thead>
<tr>
<th>Sample</th>
<th>Tensile Strength (MPa)</th>
<th>ΔTensile Strength (%)</th>
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<tbody>
<tr>
<td>Pristine</td>
<td>7.65</td>
<td>-</td>
</tr>
<tr>
<td>Water-T</td>
<td>7.75</td>
<td>1.3</td>
</tr>
<tr>
<td>Ethanol-T</td>
<td>7.87</td>
<td>2.8</td>
</tr>
<tr>
<td>PSS-T</td>
<td>7.05</td>
<td>-7.8</td>
</tr>
<tr>
<td>T20-T</td>
<td>7.19</td>
<td>-6.0</td>
</tr>
</tbody>
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Figure S6. Output of cashmere TENG when employing PDMS (thickness 1 mm) as negative dielectric material. (a) $V_{oc}$. (b) $I_{sc}$. 
Calculation of microstructure gap $x(t)$ between cashmere and PTFE

According to the equation

$$V_{oc} = \frac{\sigma x(t)}{\varepsilon_0},$$

where $\sigma$ is surface charge density, $\varepsilon_0$ is permittivity of free space ($8.85 \times 10^{-14}$ F cm$^{-1}$). For T20-T TENG, $\sigma_{\text{max}}$ is 16.8 $\mu$C m$^{-2}$ and $V_{oc}$ is 19.5 V, so $x(t)$, the calculated gap is $\sim 10 \mu$m.

Calculation of energy conversion efficiency of cashmere based TENG

i) Input energy (kinetic energy, work done on TENG by the motor)

$$E_{\text{kinetic}} = \frac{1}{2}mv^2 = 0.74 \text{ mJ} (m=1.48\text{g}, v = 1 \text{ m s}^{-1})$$

ii) Output energy (electric energy, energy delivered to the external load resistance)

$$E_{\text{electric}} = \frac{1}{R} \int_{t_1}^{t_2} V^2 dt = 0.282 \mu\text{J}$$

iii) Energy conversion efficiency ($\eta\%$)

$$\eta\% = \frac{E_{\text{electric}}}{E_{\text{kinetic}}} = 3.8\%$$