

Figure S1. (a) The output voltage and (b) the output current of devices with  $\epsilon_{pre}$  of 500%.

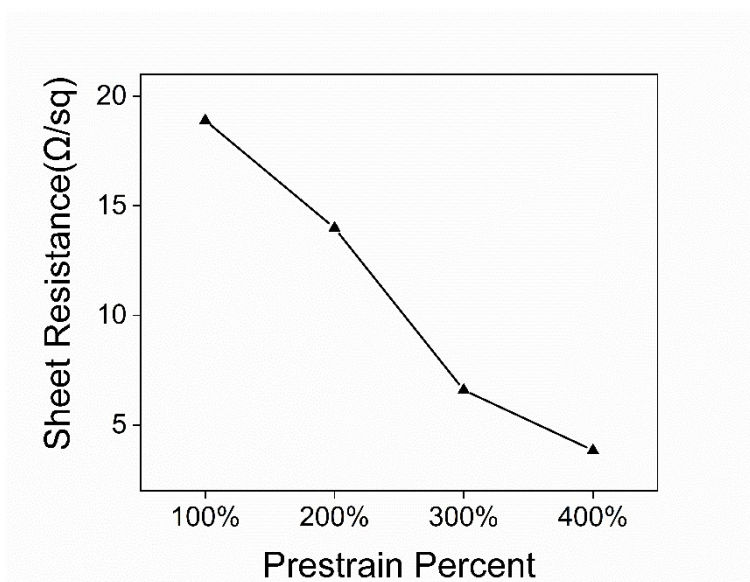


Figure S2. The sheet resistance of crumpled Al films with  $\epsilon_{pre}$  of 100%, 200%, 300%, 400%.

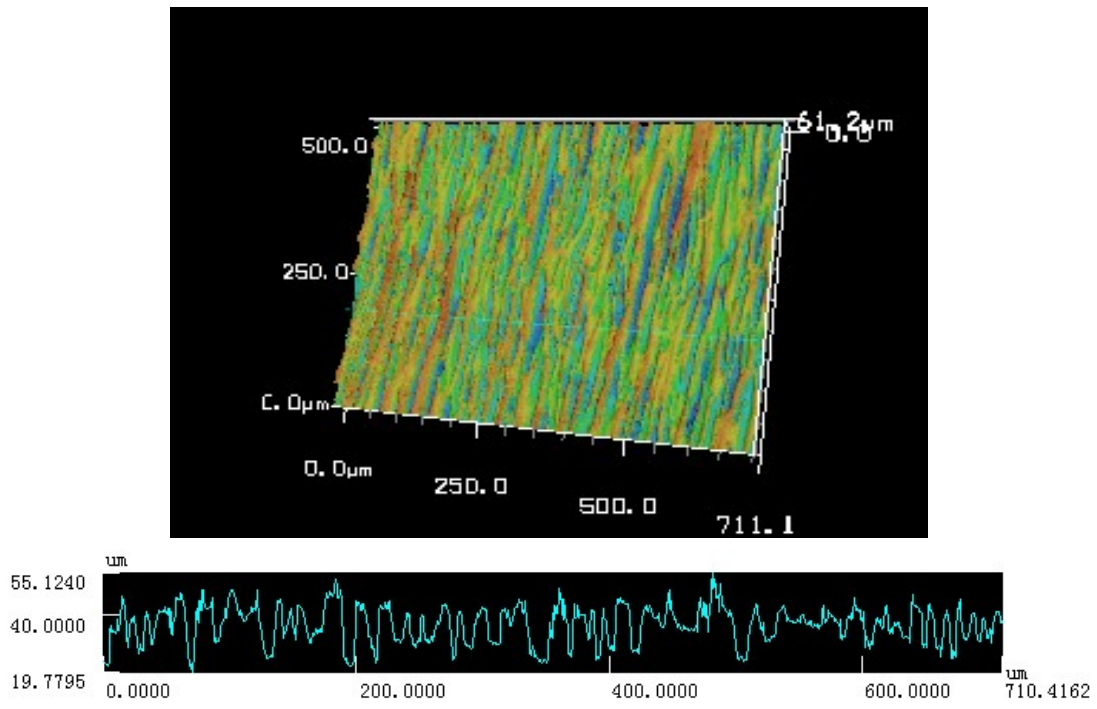


Figure S3. Surface topographic image of a representative crumpled Al film.

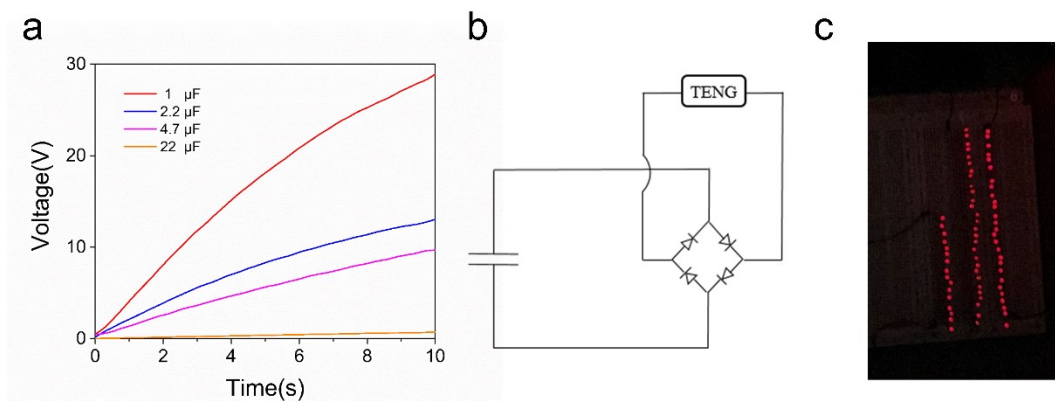


Figure S4. The application of the device. a. The charging curve of the various capacitors. b. Working circuit of the capacitor charging based the TENG. c. A photograph of LEDs lit up by the TENG.

Table S1. A review of different studies about the crumpled-structured TENG

<b>Related study</b>	<b>Materials</b>	<b>Device size</b>	<b>Maximum output voltage</b>	<b>Maximum output current</b>	<b>Maximum output power density</b>
<i>Nano Energy</i> , 2018, <b>46</b> , 73-80 <sup>49</sup>	Crumpled gold film	1.5 cm × 1 cm	124.6 V	10.13 μA	0.22 mW/cm <sup>2</sup>
<i>Nano Energy</i> , 2019, <b>58</b> , 304-311 <sup>50</sup>	Crumpled graphene film	1.5 cm × 1 cm	80.3 V	25.78 μA	0.25 mW/cm <sup>2</sup>
<i>Nano Energy</i> , 2020, <b>69</b> , 104430 <sup>51</sup>	Crumpled platinum film	1.5 cm × 1 cm	175.2 V	11.03 μA	0.518 mW/cm <sup>2</sup>
<i>Nano Energy</i> , 2020, <b>78</b> , 105266 <sup>52</sup>	Crumpled MoS <sub>2</sub> film	/	25 V	1.2 μA	0.00225 mW/cm <sup>2</sup>
<i>Nano Energy</i> , 2022, <b>92</b> , 106689 <sup>53</sup>	Crumpled MXene film	2 cm × 2 cm	16.4 V	2.67 μA	0.00289 mW/cm <sup>2</sup>
This work	Crumpled aluminum film	2 cm × 2 cm	490 V	71.74 μA	1.503 mW/cm <sup>2</sup>