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# Supplementary Material

# Carbonized Waste Cotton/Stearic Acid Composites for Photo-Thermal Conversion and Heat Storage

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**Table S1** Resistance (R) and electrical conductivity (σ) of C-SA composites and pure SA.

| sample | R (Ω) | σ (S/m) |
|---|---|---|
| pure SA | $>10^8$ | $< 10^{-6}$ |
| SA (95 wt%) | $1.2 \times 10^3$ | 0.5 |
| SA (90 wt%) | $2.1 \times 10^2$ | 2.6 |
| SA (85 wt%) | 47.2 | 11.8 |
| SA (80 wt%) | 14.5 | 38.3 |
| SA (70 wt%) | 6.8 | 81.7 |

The composites were applied as heating sources in thermoelectric device. The electrical conductivity was calculated by the formula below:

$$\sigma = \frac{l}{RA}$$

where, l is the length of the sample and A is the area with the contact of sample and electrode. SA was an insulating material. With the increase of BCF content, the electrical conductivity of the composites increased to the maximum 81.7 S/m at 70 wt% SA.

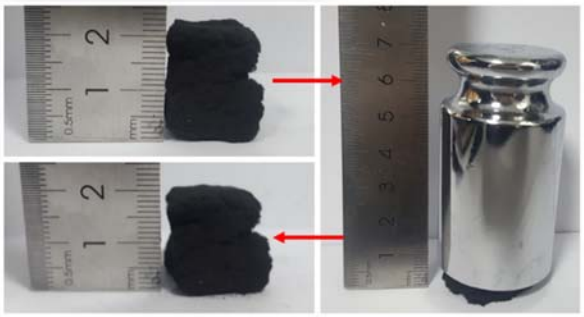

**Fig. S1** Digital photos of BCF before and after compression of 1 kg weight.

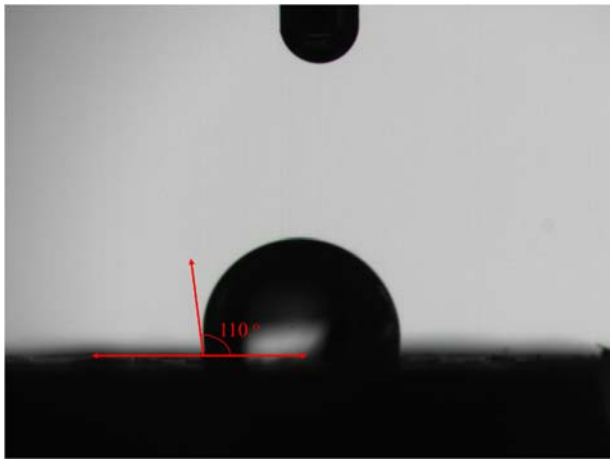


**Fig. S2** Contact angle of composites (85 wt% SA).


**Fig. S3** Under the light for 10 min, the change of composites (85 wt% SA) and pure SA

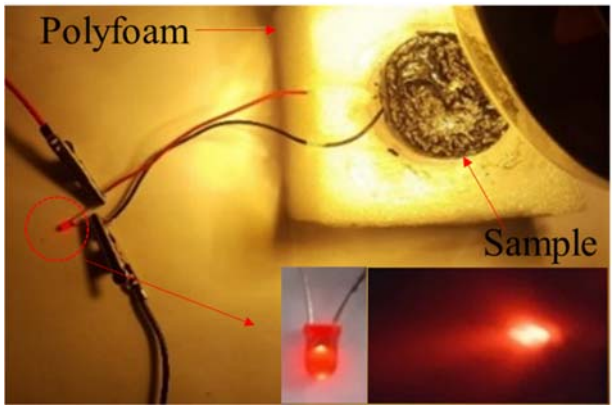


**Fig. S4** The thermoelectric system to light up red LED with strong brightness.