Electronic supplementary information

Leakage-proof Phase Change Composites Supported by Biomass Carbon Aerogels from Succulents

Yanhong Wei, Juanjuan Li, Furong Sun, Jinrong Wu, Lijuan Zhao

1. SEM measurements

To detect the morphology of SCP-63 and SCP-95, Scanning Electron Microscope (SEM) images were performed using Zeiss Ultra 55 at an acceleration voltage of 15 kV. The SEM images of SCP-63 and SCP-95 are shown in Fig. S1.

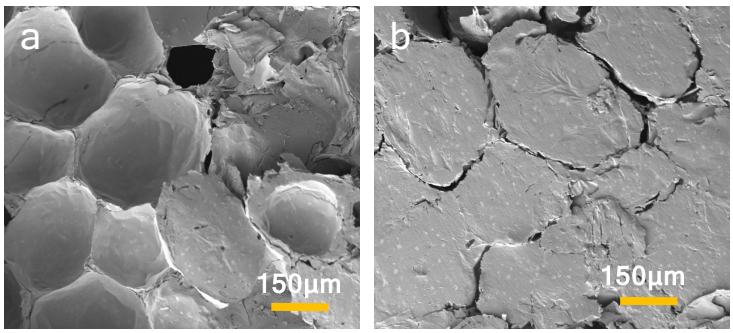

Fig. S1. SEM images of SCP-63 (a), SCP-95 (b).

2. XRD measurements

To determine the crystallization of SCP-n samples, X-ray diffraction (XRD) patterns were recorded on a diffractometer (Smartlab, Rigaku) with Ni-filtered CuKa radiation (k=0.154 nm) at a tube current of 30 mA and a generator voltage of 40 kV. Scanning was at a speed of 8 ºC·min^{-1}, from 0 to 80° of 2θ. The XRD patterns are shown in **Fig. S2**.

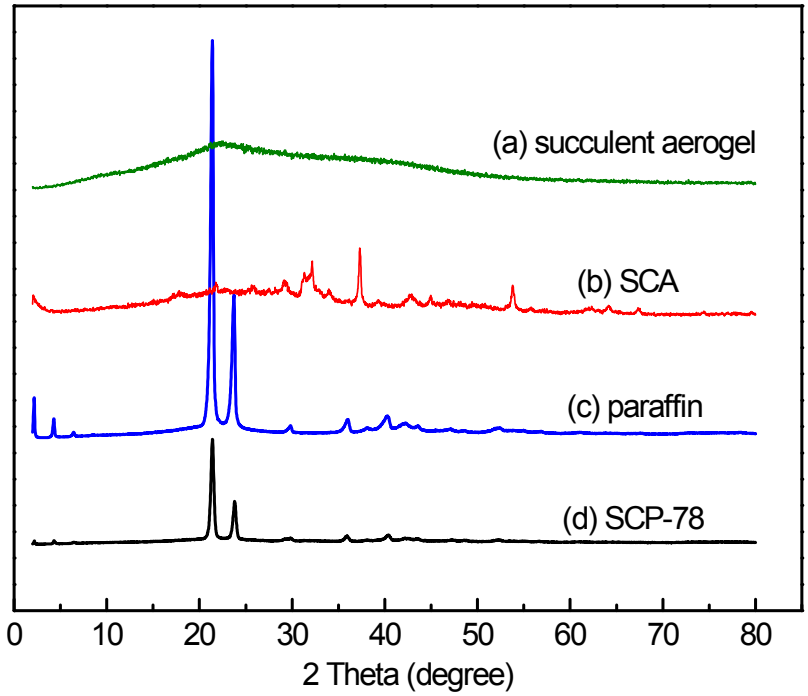

Fig. S2. XRD patterns of SCP-78, pure paraffin, SCA and succulent aerogel

3. TGA measurements

To determine the thermal stability and the paraffin content of SCP-n, thermal gravimetric analyzer (TGA) was performed by Discovery (TA Instruments, USA). The mass of the samples was about 8 mg. The SCP was heated from room temperature to 700 ℃ at a heating rate of 10 ℃ min^{-1} under nitrogen atmosphere. The TGA curves are shown in **Fig. S3** and the data for TGA curves are shown in **Table S1**.

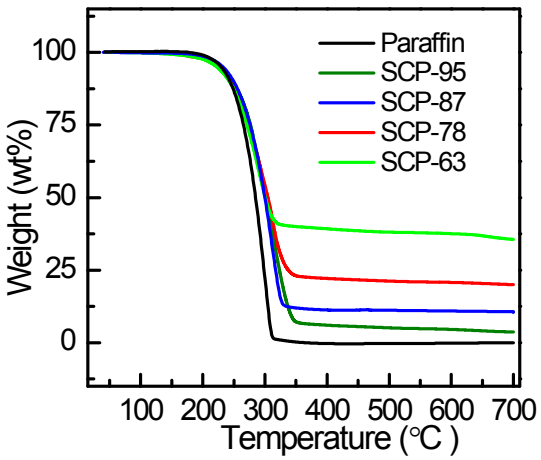

Fig. S3. TGA curves of SCP-n

Table S1. Data for TGA curves for SCP-n samples.

Sample	Onset decomposition temperature (℃)	Outset degradation temperature (℃)	Content of charred material (wt %)
Paraffin	179	326	0
SCP-95	180	360	5.2
SCP-87	180	348	12.9
SCP-78	179	362	22.1
SCP-63	178	340	37.2

4. Comparison of the measured and predicated latent heat of melting of SCP

In order to discuss the mechanism for the energy storage deeply, we compare the measured and predicated melting latent heat of SCP with various loadings of the SCA, as shown in **Fig.S4**.

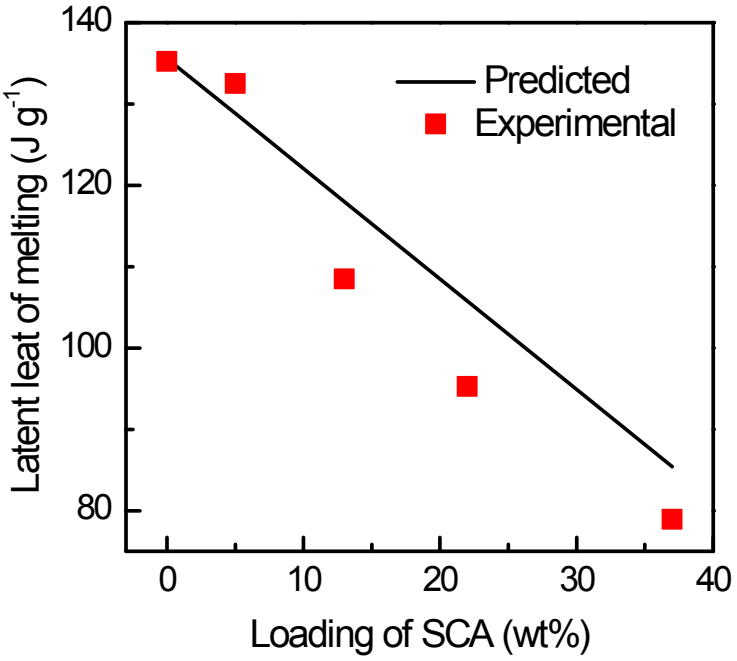

Fig. S4. Comparison of the measured and predicated latent heat of melting of SCP with various loadings of the SCA.

5. **Light-to-thermal energy conversion and storage tests in insulated environment.**

To further confirm the light-to-thermal energy conversion efficiency of SCP, an illumination experiment in insulated environment is necessary. We perform this test in a vacuum oven with a pressure about 20 Pa; this low pressure is used to approximate the insulated environment, as the measurement in strictly insulated environment is extremely time consuming. Here, the samples were also placed on a paperboard, and then directly illuminated by a heater of 40 W, which was placed over the samples with the distance of about 10 centimeters. The temperature change was recorded by a digital thermometer (TES-1310). The schematic of measuring system and the light-to-thermal energy conversion curves for pure paraffin, SCP-63, and the paperboard in vacuum environment are shown in **Fig. S5**.

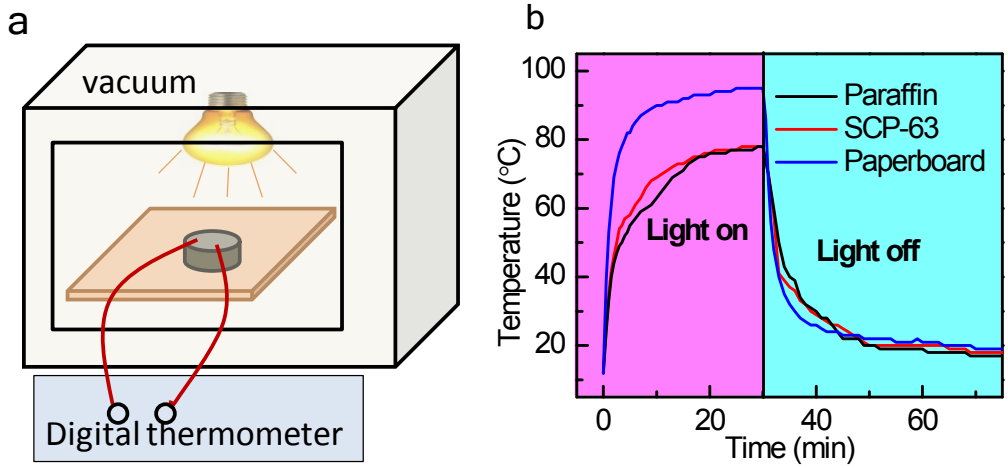

Fig. S5. The light-to-thermal energy conversion and storage tests in insulated environment. (a) The schematic of measuring system. (b) The light-to-thermal energy conversion curves for pure paraffin, SCP-63, and the paperboard in vacuum environment.