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ESI

Nanoconfinement of phase change materials within Carbon Aerogels: Phase Transition Behaviors and Photo-to-Thermal Energy Storage

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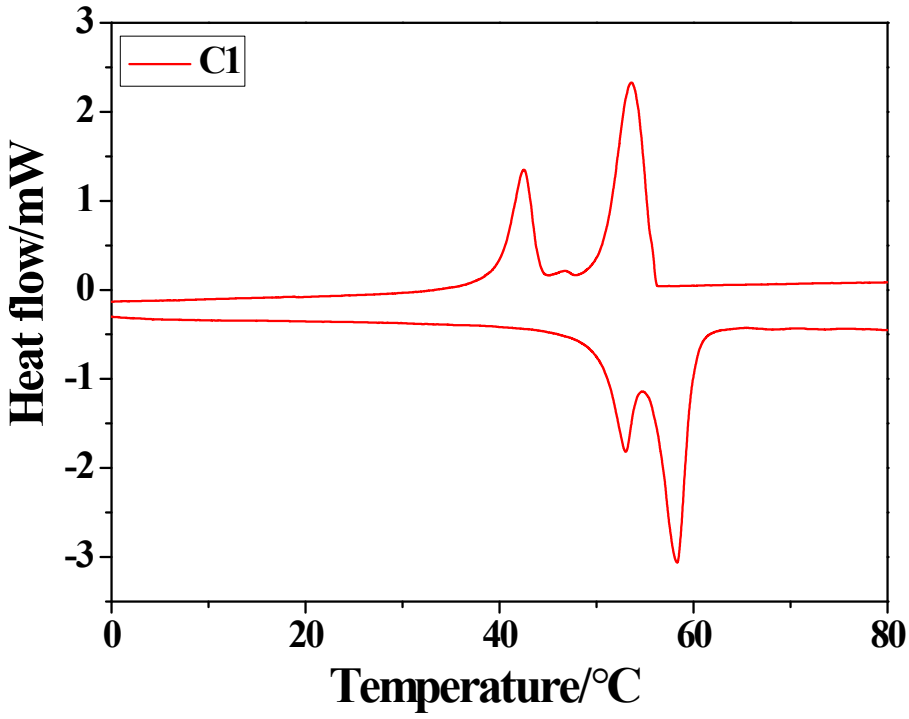

Figure S1. DSC curves of composite C1.

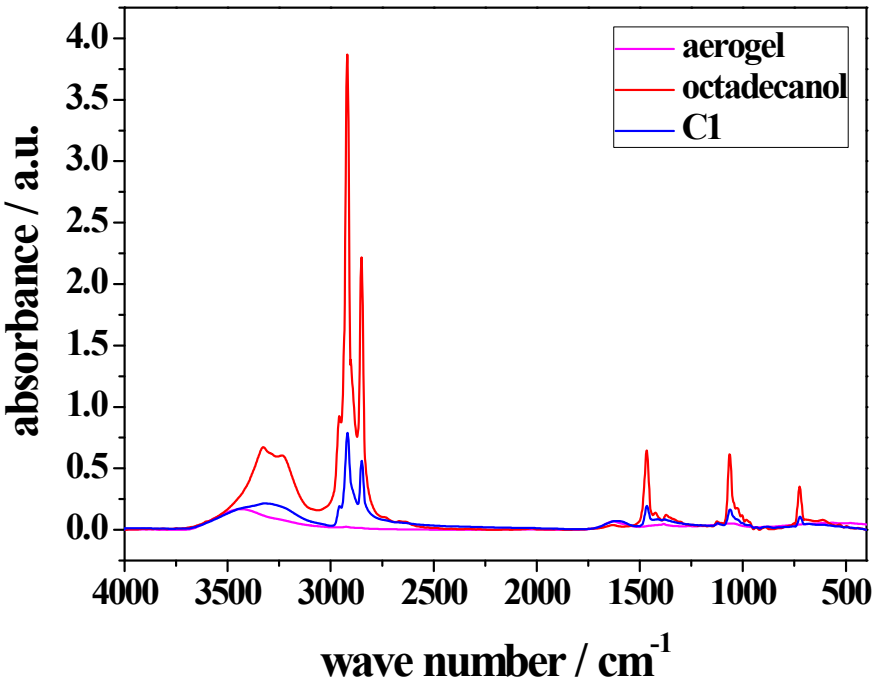

Figure S2. IR spectrum of the carbon aerogel, pure octadecanol and C1. IR spectrum suggests that the hydrogen bonding was weaken by the appearance of the aerogel.

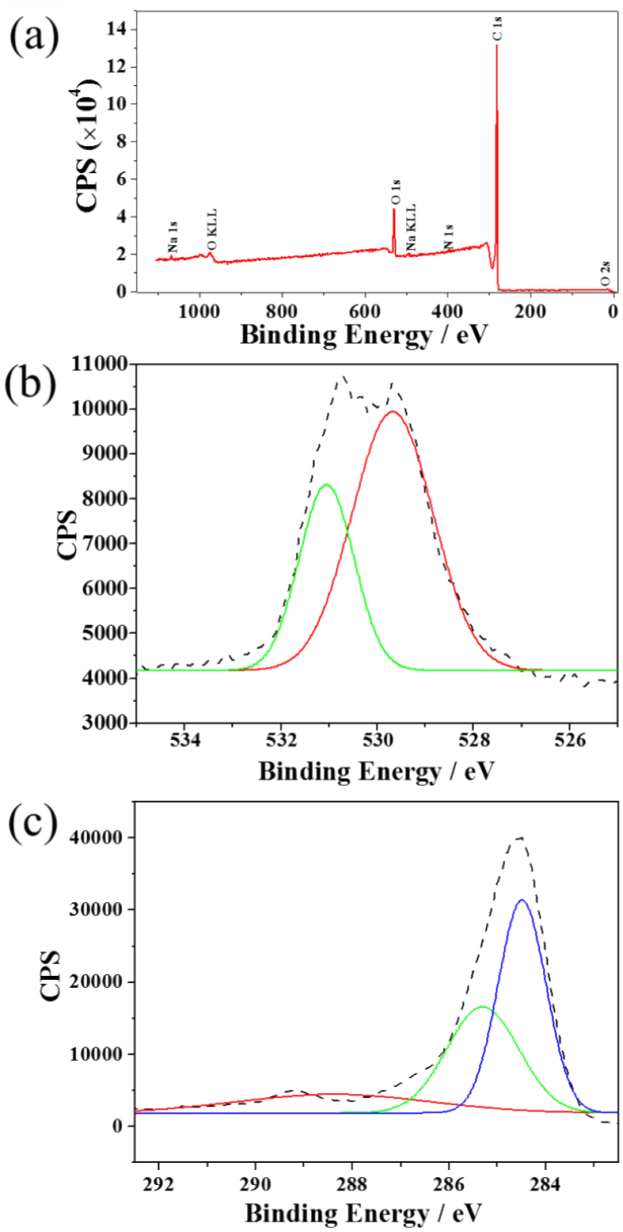

Figure S3. Detailed XPS spectrum analysis of the aerogel: (a)The XPS spectra of the carbon aerogel, (b) O 1s of the carbon aerogel, and (c) C 1s of the carbon aerogel.

The element analysis is performed by XPS. The result shows that carbon and oxygen are the two main elements in the aerogel, with atom percentage of 92.76% and 6.98%, respectively. The fitting result of O 1s spectrum shows two peaks at 529.7 and 513.1 eV, which are attributed to the bonding between carbon and oxygen, as shown in Figure 3b. The C 1s spectrum is fitted by peaks at 284.5, 285.3 and 288.4 eV attributed to C=C, C-C and C=O, respectively.[1-2] In view of the structure of glucose, oxygen atoms should be distributed uniformly along the carbon aerogel framework. In addition, although borax facilitates and accelerates the interconnection of glucose during polymerization process, XPS result reveals the absence of boron or sodium in the aerogel, which indicates that catalyst has wiped out during the solvent exchange.

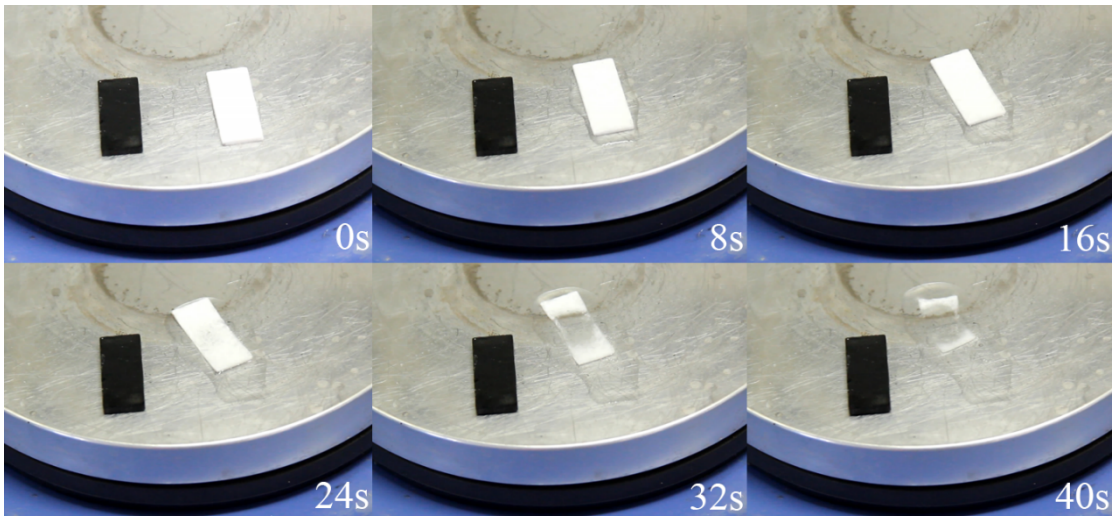

Figure S4. Holding the composite and pure PCM blocks at 60 °C. The ground composite did not deform under the temperature above the melting point of octadecanol.

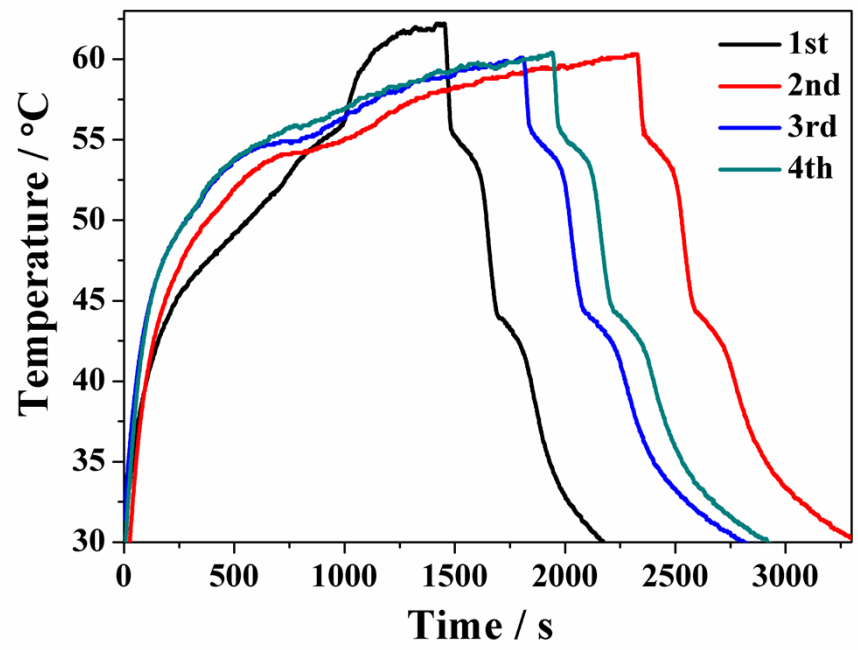

Figure S5 The recycling time-temperature curves of photo-to-thermal transfer of **C1**.

Table S1. Enthalpy comparison between the four samples and the pure PCM

Sample name	Enthalpy /(J/g)	$\%_C$[a]	$\%_I$[b]	$\%_I$ / $\%_C$
octadecanol	235	100	100	1.00
C1	175	75.9	74.5	0.982
C2	134	71.1	57.0	0.802
C3	117	50.0	49.8	0.996
C4	73	44.3	31.1	0.702

[a] $\%_C$: Content Percentage determined by the TGA test.

[b] $\%_I$: Infiltration Percentage determined by the DSC test.

When the content of the PCM is decreased, the PCM becomes discontinuous in the pores. The latent heat of the composite relies mainly on the motion of the organic molecules, which becomes more unstable when the PCM phase is discontinuous.

1. F. Meng, X. Zhang, B. Xu, S. Yue, H. Guo and Y. Luo, J. Mater. Chem., 2011, 21, 18537-18539.
2. L. Cao, Y. Liu, B. Zhang and L. Lu, ACS Appl. Mater. Interfaces, 2010, 2, 2339-2346.