Supporting Information

Recyclable low-thermal-conductivity phase change materials for building thermal management

Xiaolong Guo [a], Jin Hu [b,*], Haoyang Cheng [a], Lin Zhang [a], Kanghui Wang [a], Bingtao Tang [c], and Wentao Wang [a,d,*]

[a] *School of Materials Science and Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China.*
[b] *School of Chemistry and Pharmaceutical Engineering, Changsha University of Science and Technology, Changsha 410114, China.*
[c] *State Key Laboratory of Fine Chemicals, Dalian University of Technology, Dalian 116024, China.*
[d] *Zhejiang Sci-Tech University Shengzhou Innovation Research Institute, Shengzhou 212451, China.*

*Correspondence: jhu@csust.edu.cn, wtwang@zstu.edu.cn

Table S1. The mass ratios of each component in the PCP CPCMs.

	PVA (wt%)	CMC-Na (wt%)	PEG (wt%)	Leakage
PCP-60%	32	8	60	NO
PCP-70%	24	6	70	NO
PCP-80%	16	4	80	NO
PCP-85%	12	3	85	YES

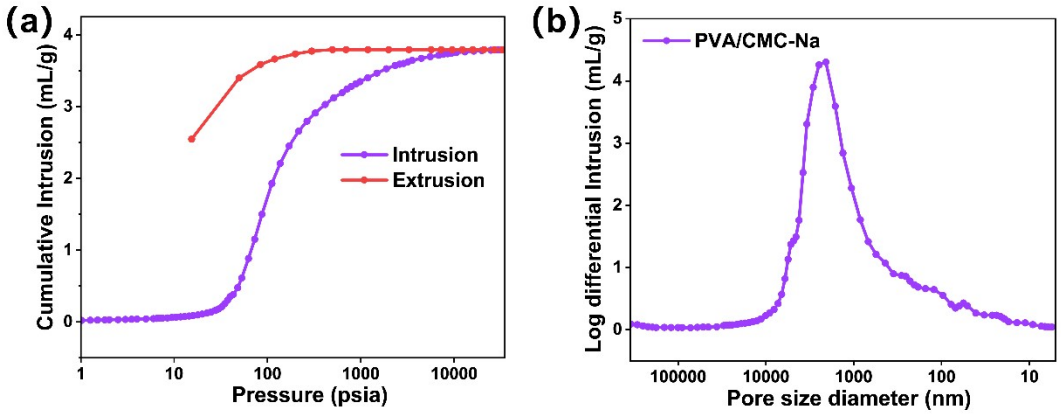

Fig. S1. (a) Mercury intrusion curve. (b) Pore size distribution curve

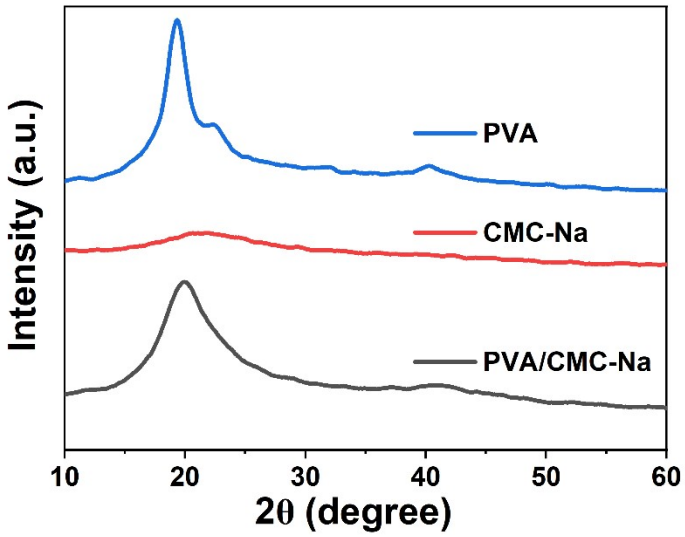

Fig. S2. XRD patterns of PVA, CMC-Na, and PVA/CMC-Na composites.

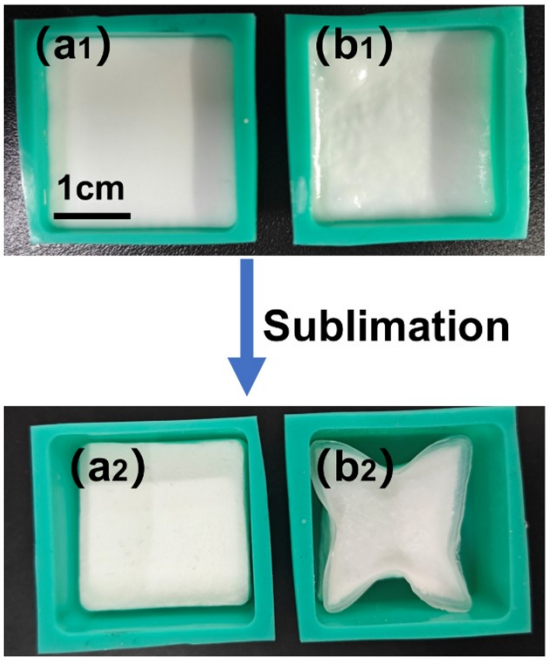

Fig. S3. Digital photos of PVA/CMC-Na/PEG after (a_1) freezing and (a_2) freeze-drying. Digital photos of PVA/PEG after (b_1) freezing and (b_2) freeze-drying.

Table S2. Thermal properties of PEG and CPCMs.

	T_m (°C)	ΔH_m (J/g)	T_c (°C)	ΔH_c (J/g)
PEG	38.81	162.77	23.11	159.56
PCP-60%	37.79	96.23	22.36	93.25
PCP-70%	37.38	108.70	21.27	104.76
PCP-80%	37.49	125.16	22.59	122.54
PCP-85%	36.96	131.59	22.74	126.80

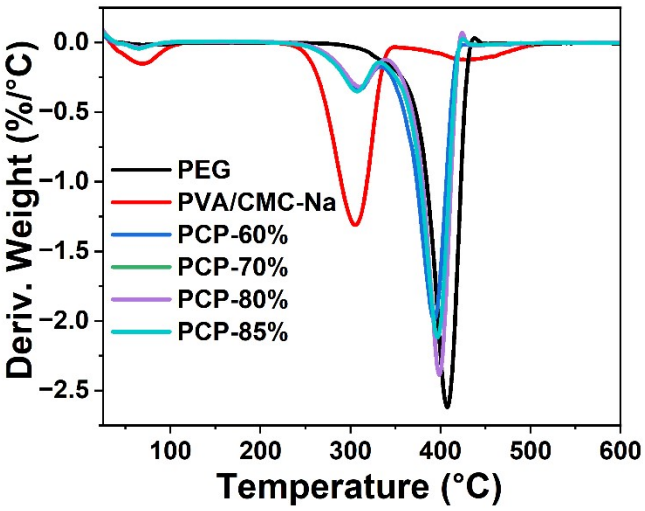

Fig. S4.TGA curves of PVA/CMC-Na, PEG, and CPCMs.

Table S3. TG data of pure PEG and different CPCMs.

	$T_{-5wt\%}$ (℃)	T_{max} (℃)	T_{end} (℃)	Weight loss (wt%)
PEG	343.15	367.48	427.17	1.70
PVA/CMC-Na	81.03	256.33	475.67	18.07
PCP-60%	292.33	361.78	418.30	7.12
PCP-70%	293.48	362.40	420.06	5.91
PCP-80%	296.37	363.62	416.85	4.21
PCP-85%	293.14	365.23	417.11	3.73

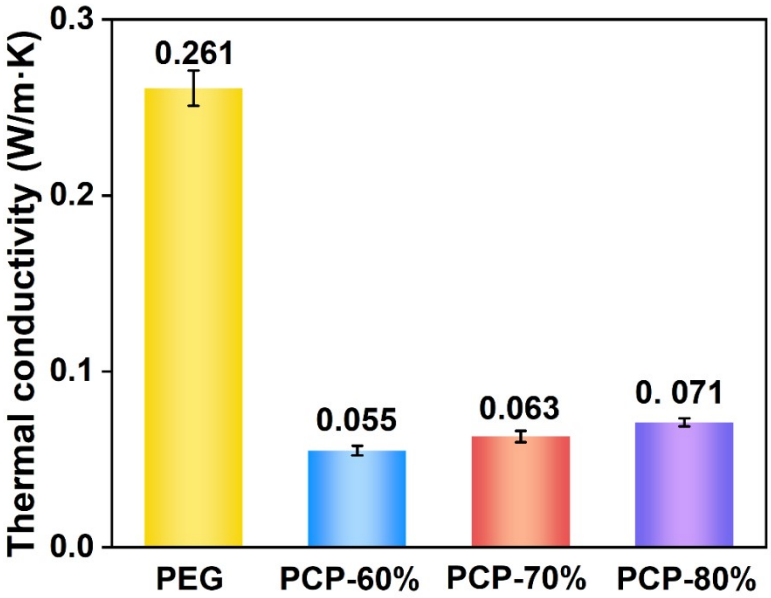

Fig. S5. Thermal conductivities of pure PEG and different CPCMs.

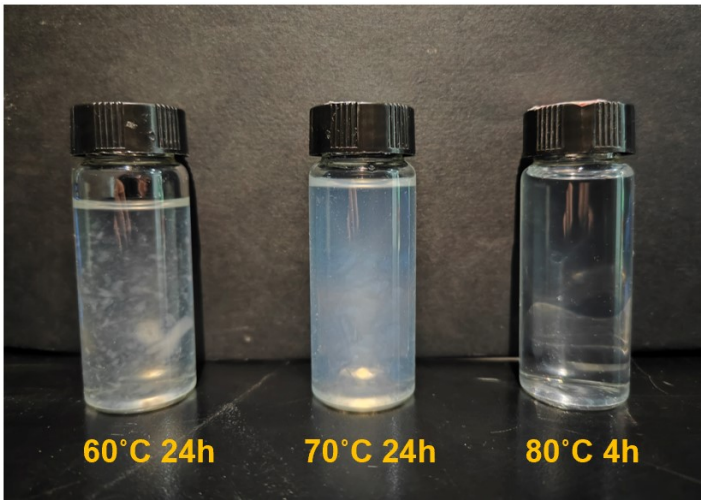

Fig. S6. The dissolution of PCP-80% at different temperatures.

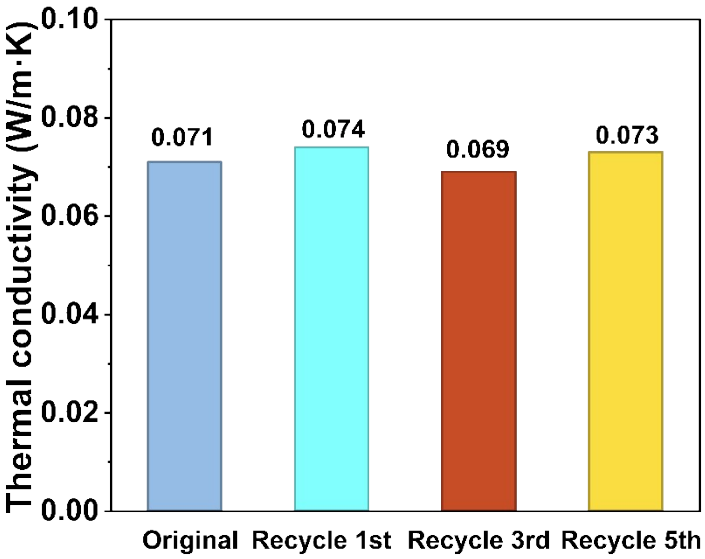

Fig. S7. The thermal conductivity of phase transition of R-PCP before and after 5 cycles of recovery.

Table S4. The thermal performance of R-PCP during different cycles of recovery.

	T_m (℃)	ΔH_m (J/g)	T_c (℃)	ΔH_c (J/g)
Original	38.33	121.18	23.26	119.55
Recycle 1st	38.19	120.52	23.27	118.87
Recycle 3rd	38.52	117.26	21.42	117.94
Recycle 5th	38.02	119.13	22.3	120.41