Short-Chain Modified SiO_2 with High Absorption of Organic PCM for Thermal Protection

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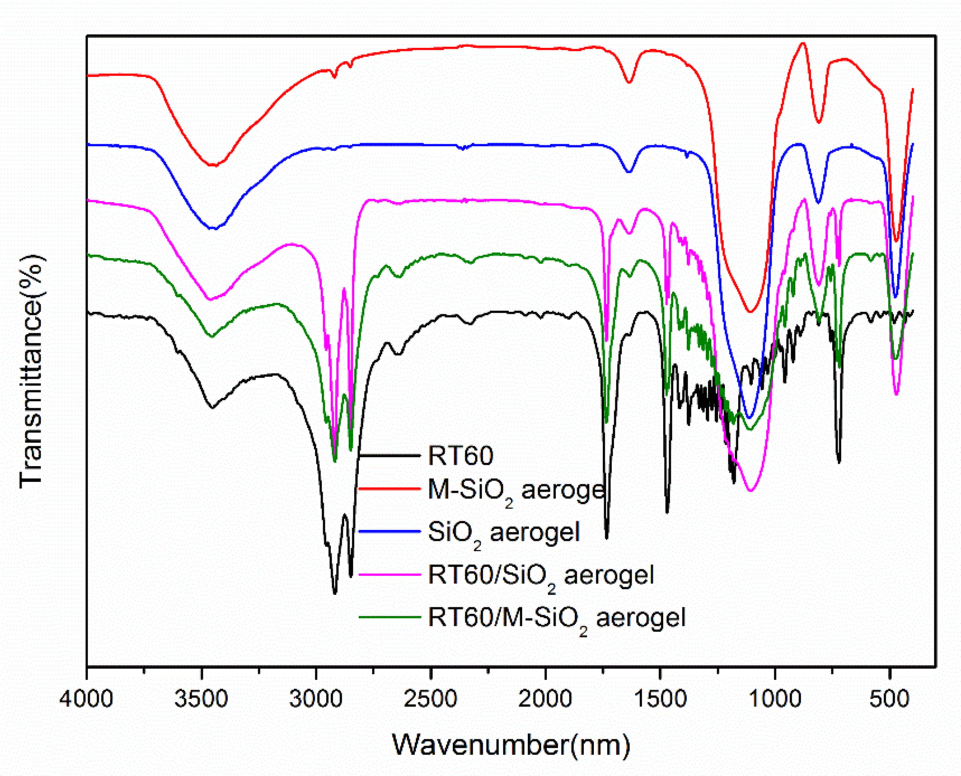

Figure S1. FT-IR spectrum of all samples.

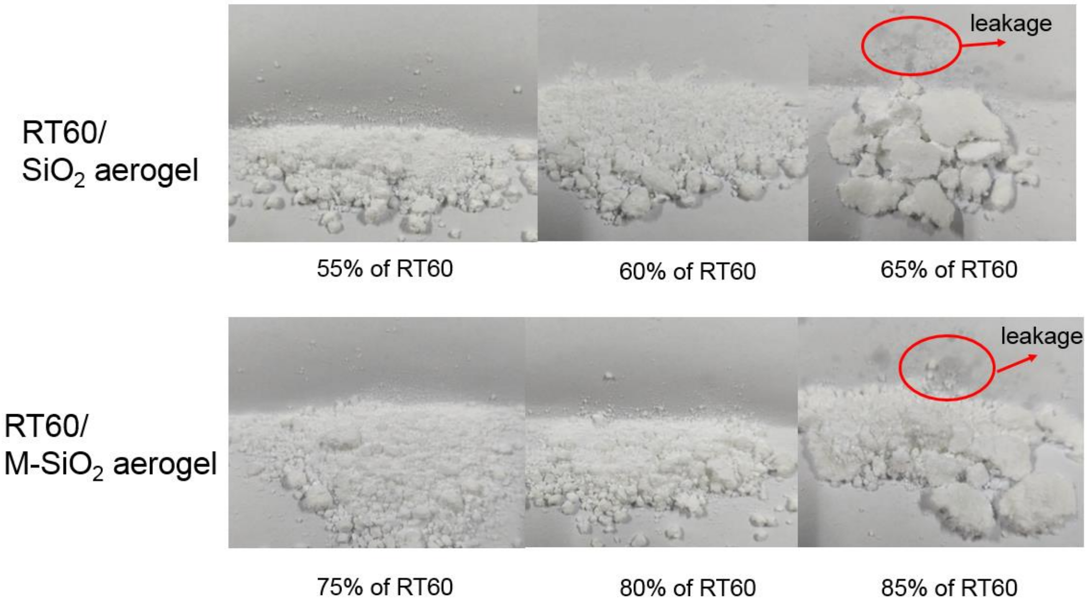

Figure S2. leakage test of RT60/SiO_2 aerogel and RT60/M-SiO_2 aerogel.

Table S1. The absorption capacity of different supporting materials.

Supporting materials	Modified agent	Organic PCMs	T_m/ ºC	$\triangle H_m$/J·g^{-1}	Mass fraction %
Montmorillonite[1]	--	RT 20	20.8	53.6	39.9%
Modified montmorillonite[2]	Hexadecyltrimethyl ammonium bromide	RT 20	23.0	79.3	58.1%
Diatomite[3]	--	Paraffin	47.8	70.5	47.4%
Calcined diatomite[4]	--	Paraffin	57.3	125.9	61.0%
Expanded perlite[5]	--	Paraffin	17.2	35.5	26.6%
Modified expanded perlite[5]	--	Paraffin	16.3	60.9	45.7%
SiO_2 aerogel[6]	--	Paraffin	17.4	78.1	54.8%
Modified SiO_2 aerogel[6]	Dimethyldichlorosilance	Paraffin	17.7	98.9	69.5%
Our work	Hexamethyl disilazane	RT60	60	180.2	80.0%

The XRD results of SiO_2 aerogel and M-SiO_2 aerogel based PCM were shown in Figure S3 and S4. In the pattern of SiO_2 aerogel and M-SiO_2 aerogel, both samples has only one broad peak around 20°. The pattern of RT60 exhibits peaks at 10°, 14.2°, 21.5°, 23.9°, 38.9° and 42.1°. The sharp diffraction peaks at 21.5° and 23.9° are attributed to the diffractions of (110) and (200) crystal planes of paraffin[7]. Figure S4 shows the pattern of RT60/SiO_2 aerogel and RT60/M-SiO_2 aerogel, both RT60/SiO_2 aerogel and RT60/M-SiO_2 aerogel keep two sharp peaks at 21.5° and 23.9° of RT60, while other peaks strongly decrease the intensity, because the RT60 is encapsulated by SiO_2 aerogel and M-SiO_2 aerogel. In general, both of RT60/SiO_2 aerogel and RT60/M-SiO_2 aerogel do not exhibits new peaks in the XRD pattern, verifying the physical combination of RT60 and SiO_2 aerogel/M-SiO_2 aerogel.

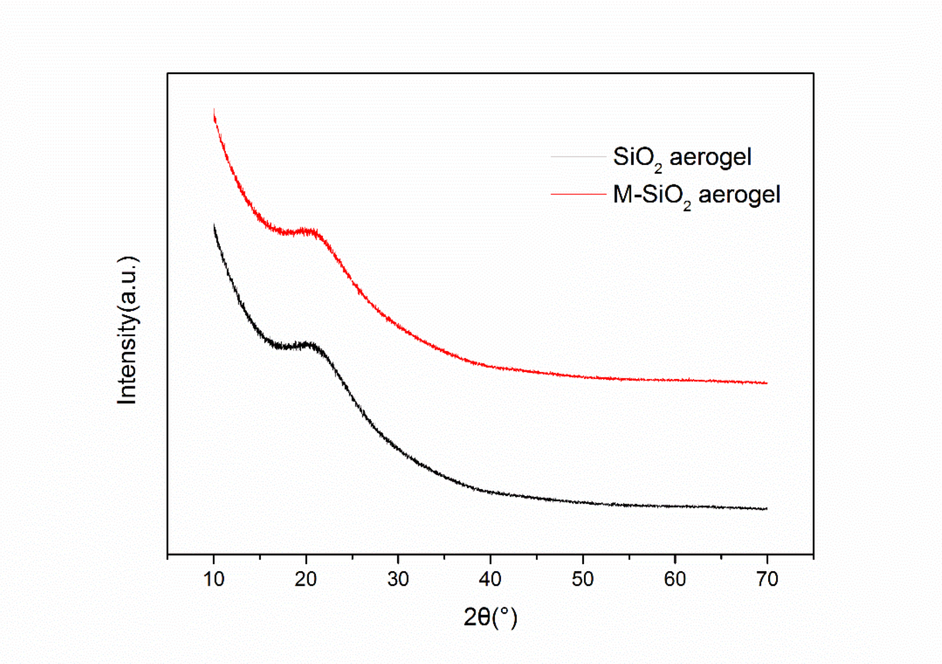

Figure S3. XRD patterns of the SiO_2 aerogel and M-SiO_2 aerogel.

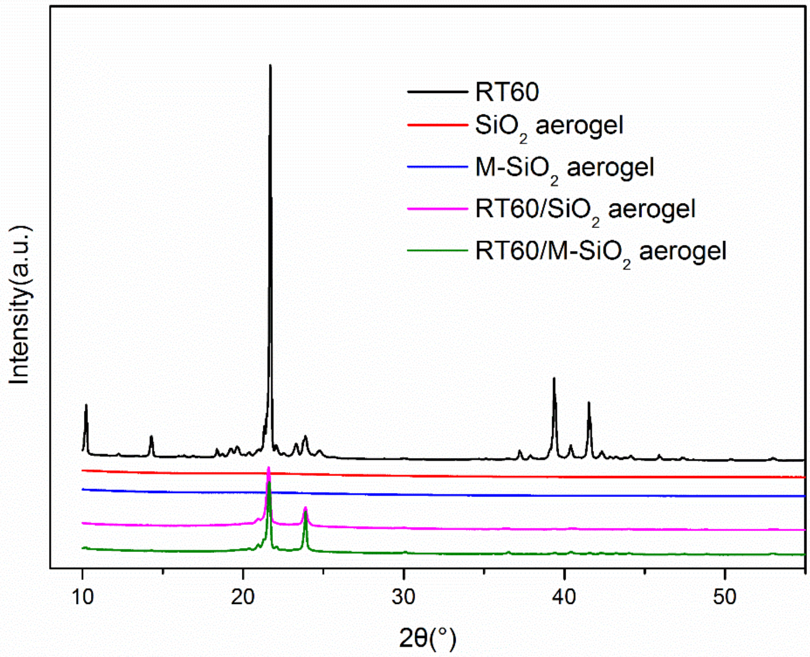

Figure S4. XRD patterns of all samples.

Table S2. The melting and freezing behavior of SiO_2 aerogel and M-SiO_2 aerogel based PCM.

	T_m/ ºC	ΔH_m/J·g^{-1}	T_f/ ºC	ΔH_f/J·g^{-1}	η/%
RT60	57.98	225.3	56.61	223.6	-
RT60/SiO_2 aerogel	57.78	130.5	57.56	129.4	57.9
RT60/M-SiO_2 aerogel	57.32	180.2	57.16	178.9	80.0

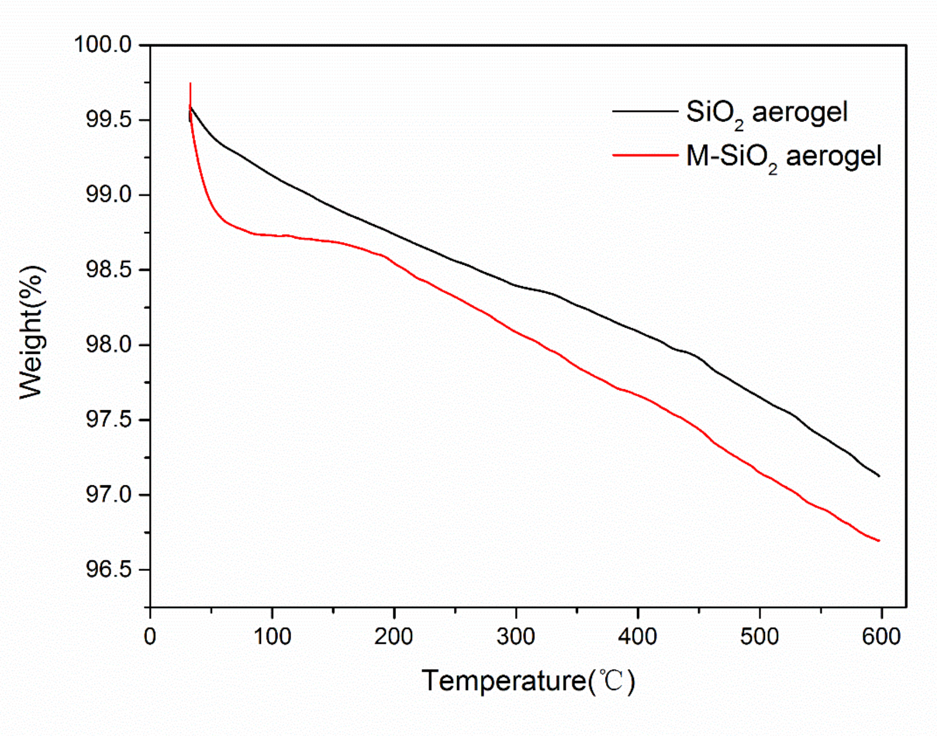

Figure S5. Weight loss of SiO_2 aerogel and M-SiO_2 aerogel.

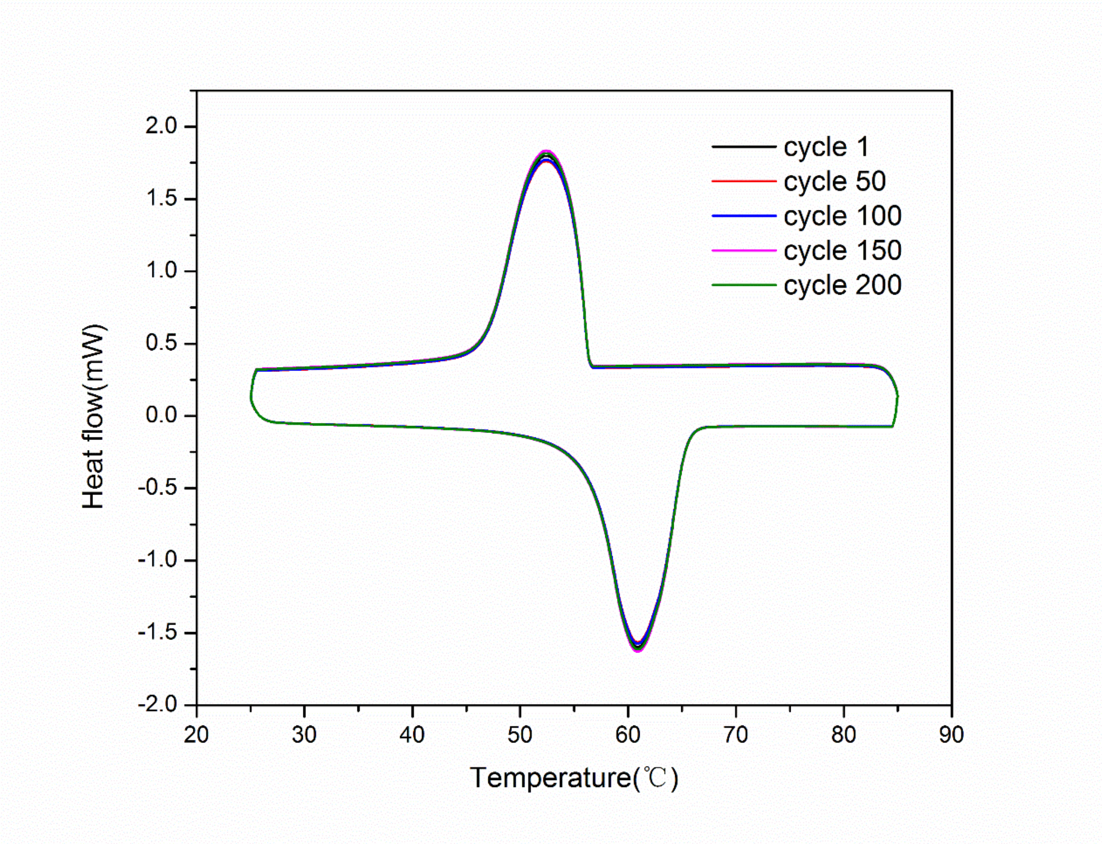

Figure S6. Melting and freezing behavior of RT60/ SiO_2 aerogel with different heating/cooling.

cycle.

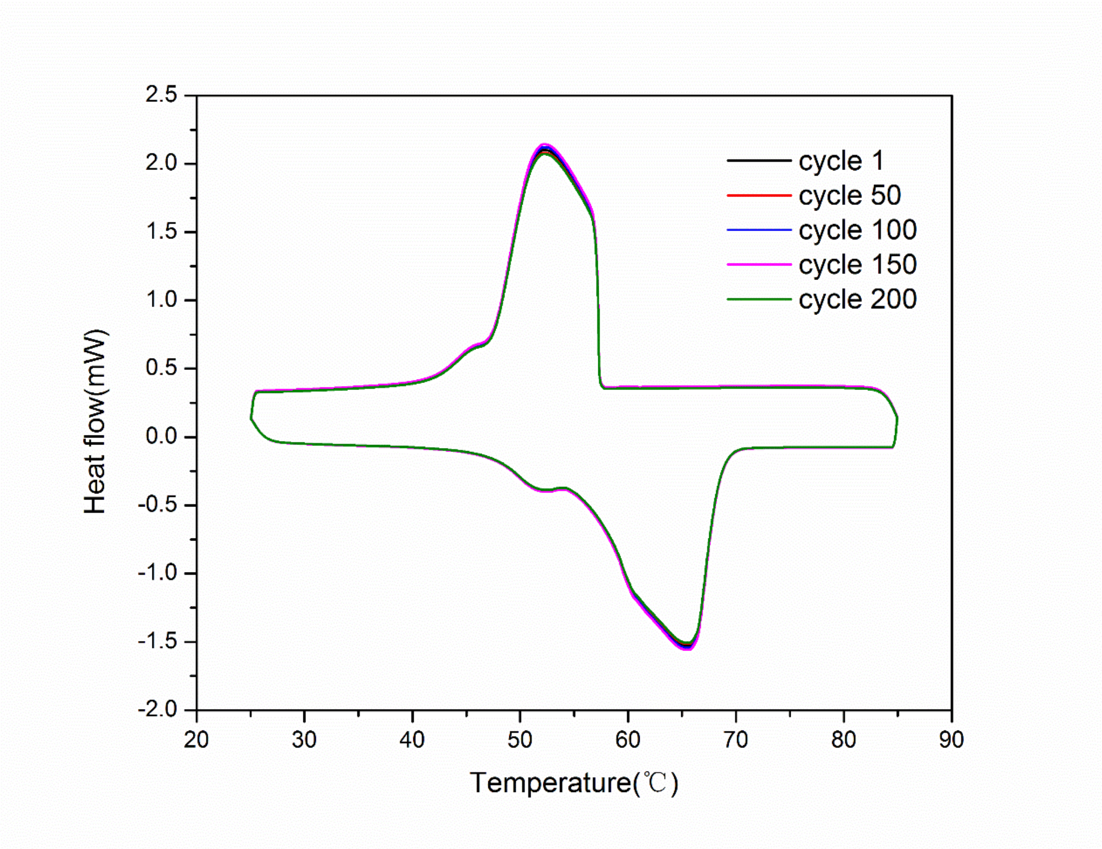

Figure S7. Melting and freezing behavior of RT60/M-SiO_2 aerogel with different heating/cooling cycle.

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