

## *Supporting Information For*

# Nanoencapsulated Crystallohydrate Mixtures for Advanced Thermal Energy Storage

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### **SUPPORTING INFORMATION CONTENTS:**

Figure S1: SEM images of the crystallohydrate capsules.

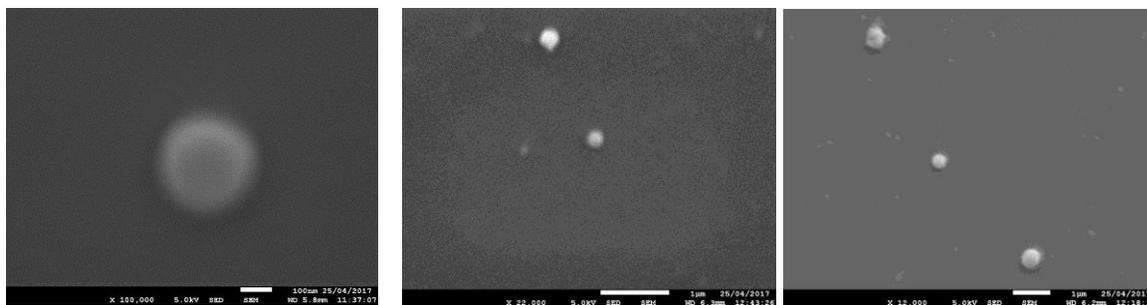
Figure S2: TEM of NanoPCM1 sample showing partly removed capsule shell.

Figure S3: XPS spectra for (a)  $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  and NanoPCM1 and (b) NanoPCM2.

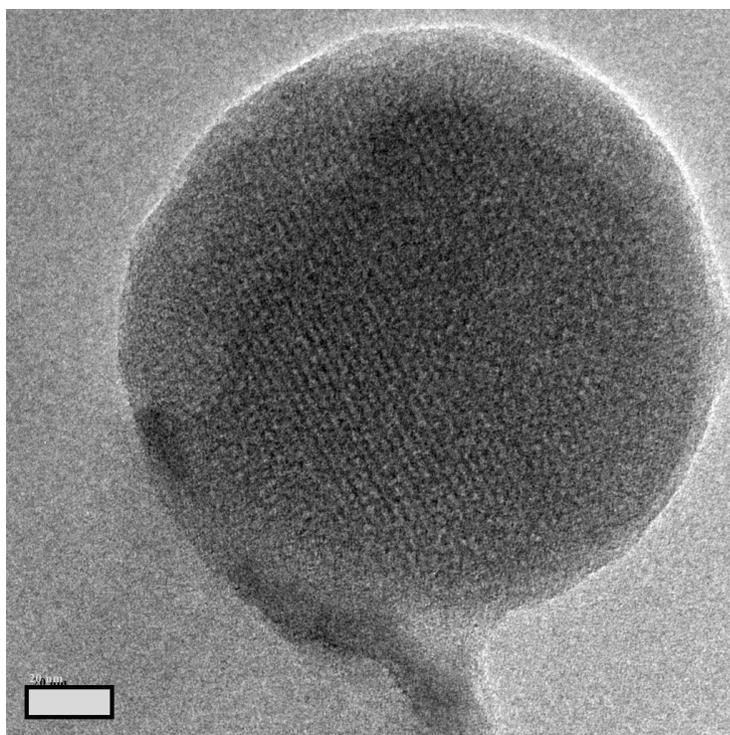
Table S1: Summary of XPS data.

Figure S4: FTIR spectra from the different batches of the PCM-loaded capsules demonstrating the reproducibility of crystallohydrate encapsulation methodology.

Table S2. Thermal properties of NanoPCMs.

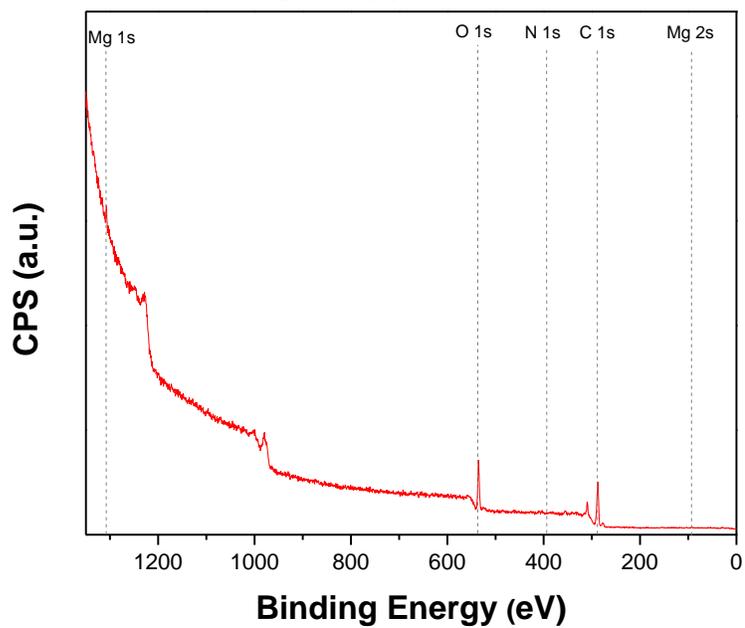


**Figure S1.** SEM images of (from left to right) NanoPCM1 (scale bar 100 nm), NanoPCM3 (scale bar 1 μm), NanoPCM4 (scale bar 1 μm), prepared by taking the samples from the capsule suspension after reaction and diluted to approx. 0.1%wt solid content.

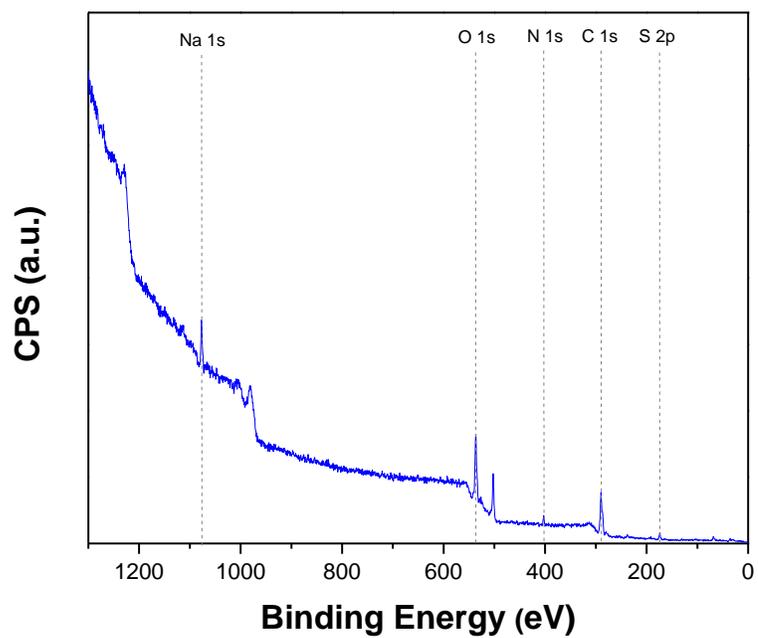


**Figure S2.** TEM image of NanoPCM1 sample with partly removed capsule shell (scale bar 20 nm).

**Fig. S3 (a) NanoPCM1**



**Fig. S3 (b) NanoPCM2**

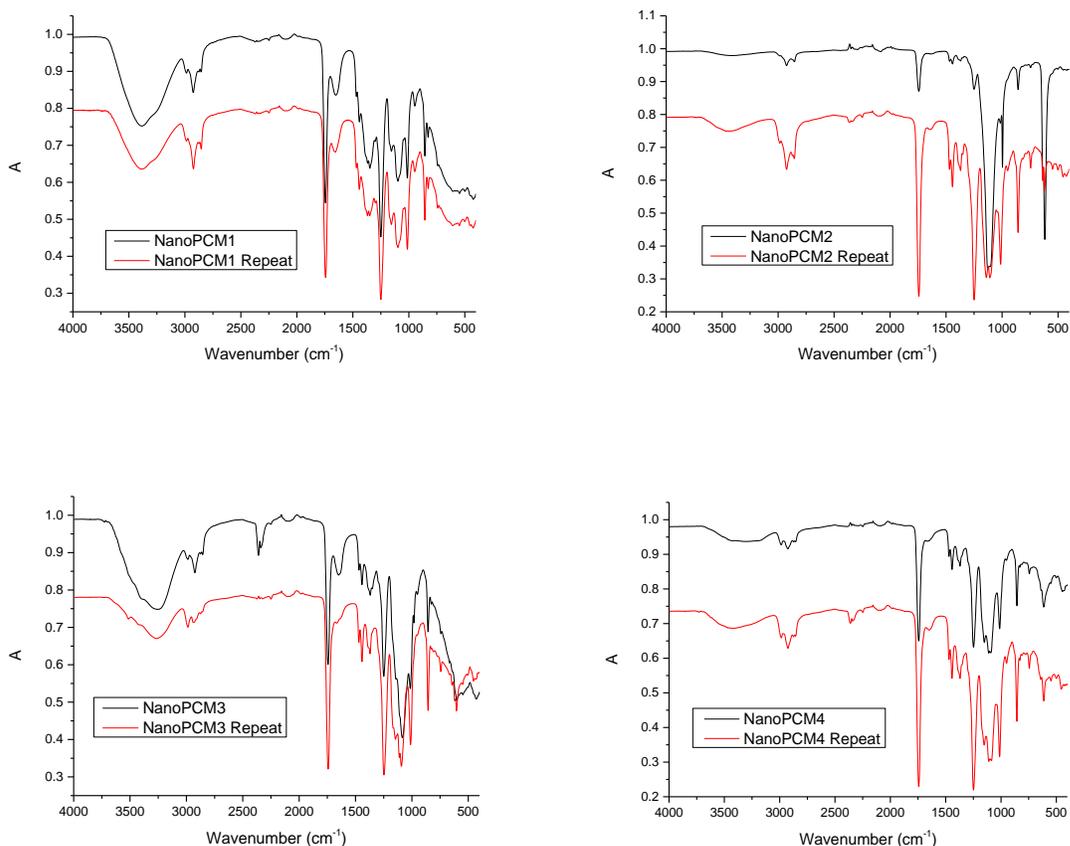


**Figure S3.** XPS spectra for (a) NanoPCM1 and (b) NanoPCM2.

**Table S1.** Summary of XPS data.

	NanoPCM1	NanoPCM2
<i>Mg</i>	1.24%	n/a
<i>Na</i>	n/a	6.30%
<i>C</i>	77.91%	63.41%
<i>O</i>	19.40%	25.42%
<i>N</i>	1.44%	3.83%
<i>S</i>	n/a	1.03%

Presence of Na and Mg is clearly demonstrated in the NanoPCM samples and the values obtained for them as well as for the other elements are consistent with FTIR and DSC measurements.



**Figure S4.** FTIR spectra from the different batches of the PCM-loaded capsules demonstrating the reproducibility of crystallohydrate encapsulation methodology.

**Table S2.** Thermal properties of NanoPCMs.

<b>Sample</b>	<b>T<sub>M</sub> (°C)</b>	<b>T<sub>F</sub> (°C)</b>	<b>Supercooling (°C)</b>	<b>ΔH (J·g<sup>-1</sup>)</b>	<b>Encapsulation Efficiency</b>
<b>NanoPCM1</b>	92	82	10	88.4	54%
<b>NanoPCM2</b>	32	17	15	138.6	61%
<b>NanoPCM3*</b>	N/A	N/A	N/A	N/A	N/A
<b>NanoPCM4</b>	15.4	-1.1	16.5	126.8	67%

\*The data for NanoPCM3 is not available due to the incongruent nature of the melting and crystallisation processes in the mixed phases of the capsule core forming unstable phases at each cycle, see main text, Figure 8c.