

Supplementary Materials

Form-Stable Phase-Change Materials Using Chemical Vapor Deposition-Derived Porous Supports: Carbon Nanotube/Diatomite Hybrid Powder and Carbon Nanotube Sponges

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Table S1. Parameters used in the analytical model and their assumed values

| Domain | Parameter | Symbol | Value |
|-----------------------|-------------------------|--------------|------------------------|
| Exterior ambient air | Temperature at infinity | T_{ext} | 42 °C |
| | Convection coefficient | h_{ext} | 20 W/m ² K |
| External plaster wall | Wall thickness | d_1 | 2 cm |
| | Thermal conductivity | λ_1 | 0.22 W/mK |
| Form-stable PCM layer | Layer thickness | d_{PCM} | output |
| | Melting temperature | T_m | experimental value |
| | Latent heat of fusion | ΔH_m | experimental value |
| | Density | ρ | experimental value |
| | Time for complete melt | Δt | 12 h |
| Internal brick wall | Wall thickness | d_2 | 20 cm |
| | Thermal conductivity | λ_2 | 0.3 W/mK |
| Interior ambient air | Temperature at infinity | T_{int} | 26 °C |
| | Convection coefficient | h_{int} | 8.6 W/m ² K |



Figure S1. Leakage test at 60 °C (a) for PEG/CNTs/DE (b) and PEG/CNS (c)

Electrical measurements: van der Pauw method

Following Pauw's method, four metal contacts are applied on the sample denoted as A, B, C and D in the Figure S1. The voltage between contacts A and B is first varied and the current between contacts C-D is measured, then the voltage between B-C is varied measuring the current between D-A. From the I-V curves obtained is possible to evaluate the resistance. The same method was also applied to a diatomite-CNT tablet obtained by subjecting the powder to a pressure of 5T for 20 seconds.



Figure S2. Pictures of the two samples used for the electrical measurements on the diatomite-CNT powder and a schematic of the four-probe method. On the left, the spare diatomite-CNT powder was deposited in a container equipped with four electrical contacts and on the right the powder was pressed at 5 T for 20 s to form a tablet and then measured with the four electrical contacts configuration.

To conclude the electric characterization, we also graphed the van de Pauw function, [1] shown in Figure S3, to evaluate the sheet resistance ρ/d , obtained when the $f(\rho/d) = 1$ as indicated in the figure. For the powder $\rho/d = 39.7 \pm 0.3 \text{ k}\Omega/\text{sq}$ and for the tablet $\rho/d = 2.246 \pm 0.005 \text{ k}\Omega/\text{sq}$. In particular, in the case of the tablet it was possible to measure the thickness ($d = 0.30 \pm 0.02 \text{ mm}$) and the resistivity found is $\rho = 6.74 \pm 1.14 \text{ }\Omega\text{m}$.

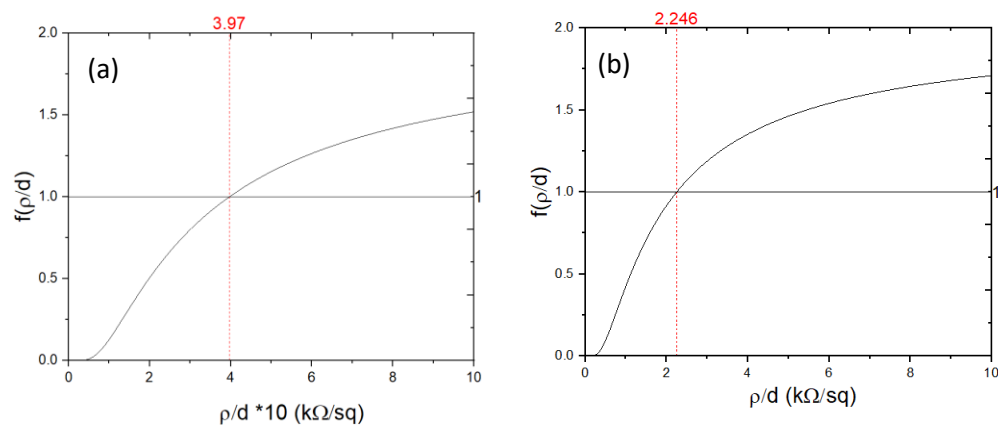


Figure S3. Van der Pauw function for the diatomite-CNT powder (a) and for the tablet (b).

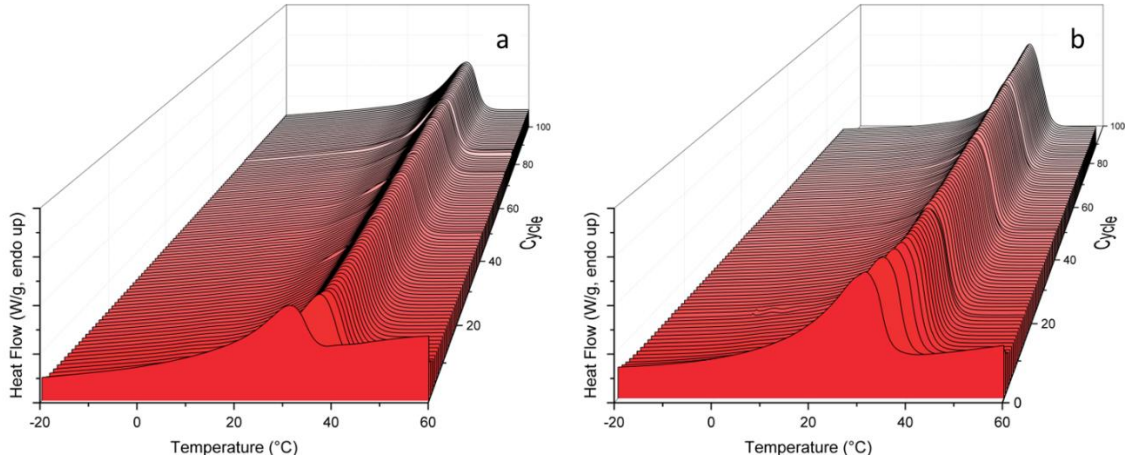


Figure S4. DSC Thermal cycles for (a) PEG/CNTs/DE and for PEG/CNS (b) samples.

REFERENCES

- [1] The van der Pauw function can be expressed as $f\left(\frac{d}{\rho}\right) = e^{-\left(\pi R_{AB,CD} d/\rho\right)} + e^{-\left(\pi R_{BC,DA} d/\rho\right)}$, where $R_{AB,CD}$ and $R_{BC,DA}$ are the values of the electrical resistance estimated from the four probe measurement, d is the sample thickness and ρ is the resistivity. From ref. A method of measuring specific resistivity and Hall effect of discs of arbitrary shape, L. J. van der Paw, Philips Res. Reports 13, 1-9, (1958).