applied sciences

MDPI

Supplementary Materials

Edible Oils as Practical Phase Change Materials for Thermal Energy Storage

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S1. Materials and Methods

Figure S1. Edible oil products measured in this study. (**a**) Parkay® margarine, (**b**) Imperial® margarine, (**c**) Crisco® vegetable shortening, (**d**) refined coconut oil and (**e**) virgin coconut oil. The ingredients specified on each product label are shown. (**f**) Virgin coconut oil in 2.3 kg containers sold at a Canadian wholesaler at the equivalent price of $US 5/L.

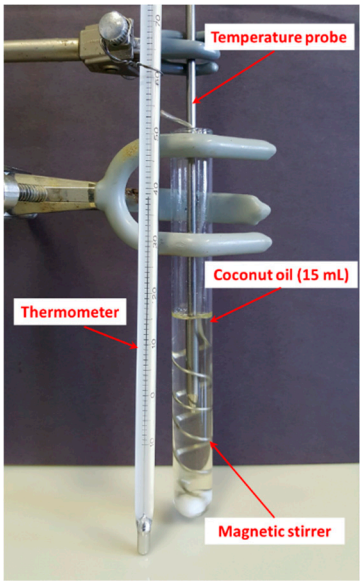

Figure S2. Bench-top setup used to measure the cooling/heating curves of bulk (15 mL) samples of refined coconut oil (R-CNO). The temperature probe was connected to a computer interface to record temperature vs. time data for the sample and the mercury thermometer measured the temperature of the room. The R-CNO sample is shown in its liquid state.

S2. Results and Discussion

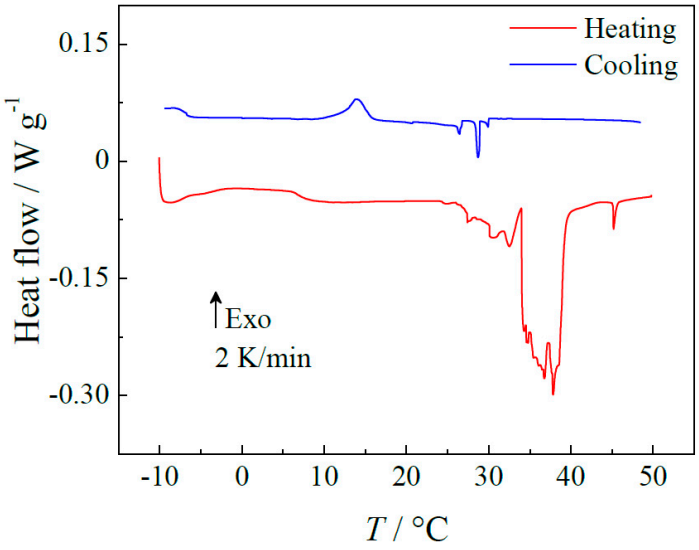

Figure S3. DSC thermograms showing heating curve followed by and cooling curve for margarine sample M2 measured at 2 K/min. Multiple peaks were observed within and around the main endothermic peak and onset of melting was not well defined.

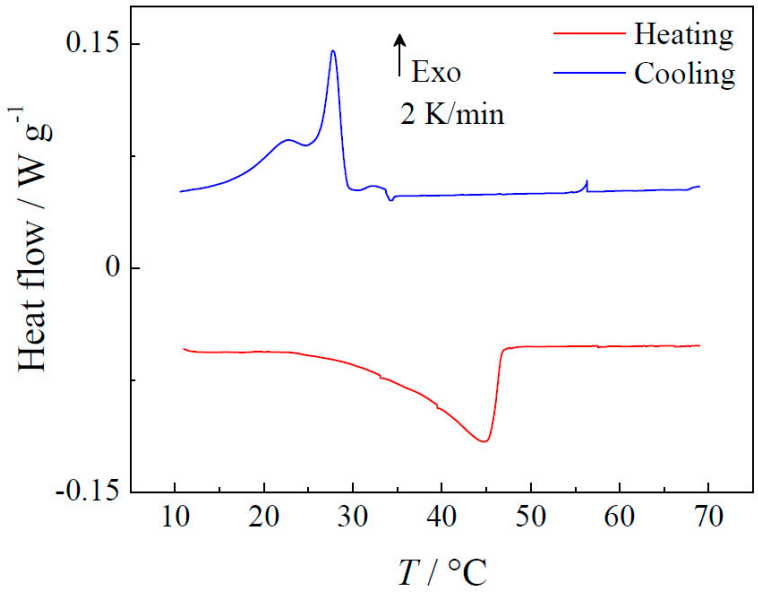

Figure S2. DSC thermograms showing heating curve followed by and cooling curve for vegetable shortening sample, VS, measured at 2 K/min.

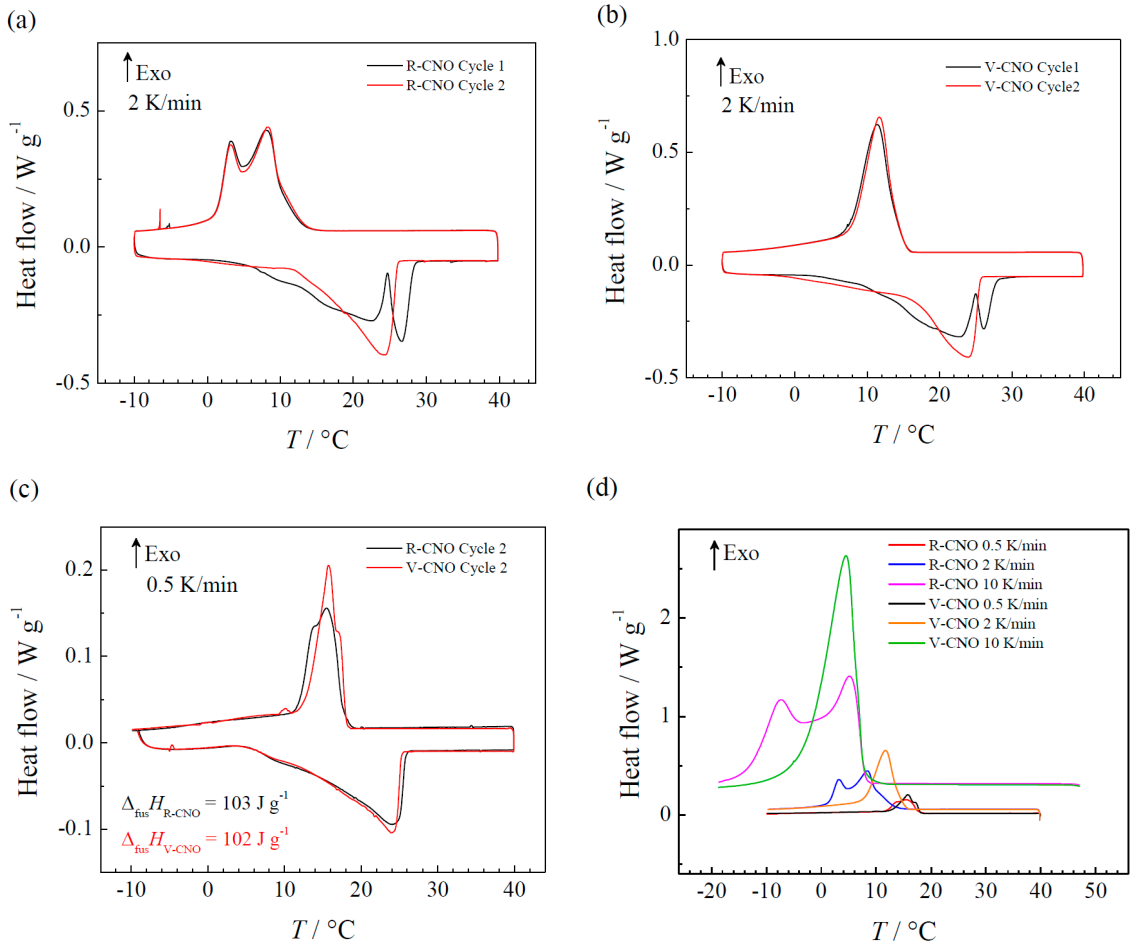

Figure S3. DSC thermograms for (**a**) refined coconut oil (R-CNO) and (**b**) virgin coconut oil (V-CNO) measured at 2 K/min. Two melt-freeze cycles are shown for each sample. (**c**) DSC thermograms of V-CNO and R-CNO measured at 0.5 K/min (2nd melt-freeze cycle only) show that there are no changes in the T_{mpt} and $\Delta_{fus}H$ (see Table 3 in the main manuscript) when the samples are measured at a slower rate. (**d**) The solidification (exothermic) peaks show that the degree of supercooling (as determined from the onset temperature of the peak) decreases when the samples are cooled at a slower rate. Note that the apparent area of the peaks is influenced by the cooling rate, but $\Delta_{fus}H$ is not.

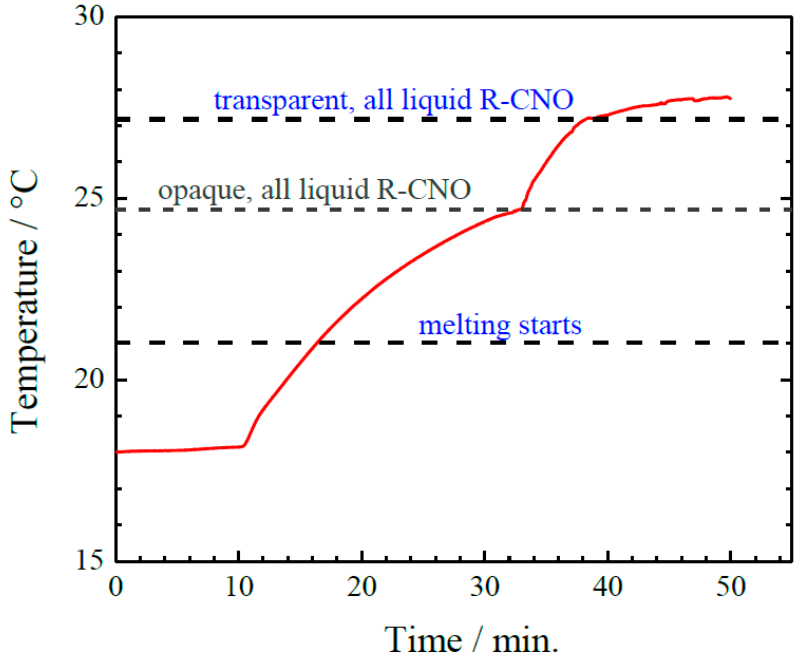

Figure S4. Temperature versus time curve collected while heating a 15 mL sample of R-CNO by hot air from 18 to 28 °C. The heating started at time t = 10 min. The dashed lines indicate the temperatures at which changes in the sample were observed.

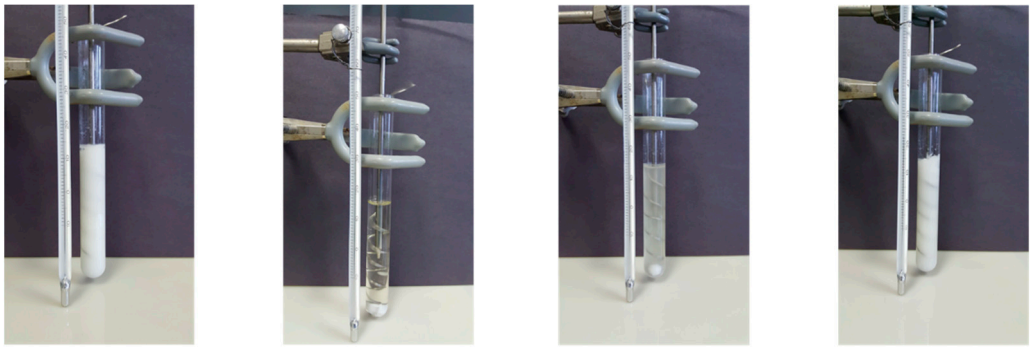

Figure S5. Changes in the appearance of the bulk refined coconut oil sample (R-CNO) as it undergoes melting then solidification at room temperature.

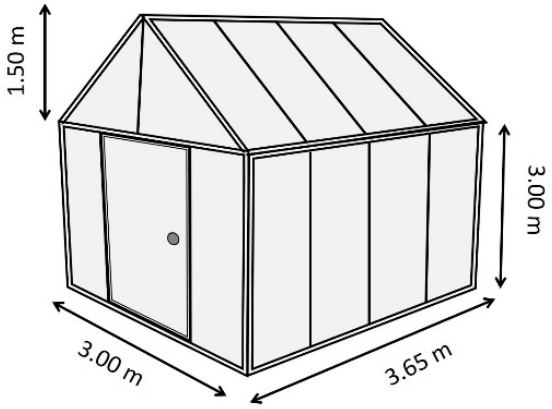

Figure S6. Schematic with dimensions for the greenhouse used in the calculation of the heat load and the mass of coconut oil needed to store this heat.