

Supporting Information

Morphology and characteristics of starch nanoparticles self-assembled via a rapid ultrasonication method for peppermint oil encapsulation

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Table S1 Chain Length Distributions of Primary Short Linear Glucan (SLG), Short SLG (S-SLG), and Long SLG (L-SLG)

Sample	Molecular weight	Content of F1 (%)
Short linear glucan	13.5	97.4±0.71 ^a
Short-short linear glucan	9.5	78.1±0.58 ^b
Long-short linear glucan	15.1	91.8±0.87 ^a

Short linear glucan powder: debranched cooked waxy maize starch.

Table S2 Onset, Peak, and Conclusion Temperature (To, Tp, and Tc, Respectively) and Enthalpy Change (ΔH) of Starch Nanoparticles (SNPs) and Peppermint Oil (PO)-loaded SNPs

Sample	To/°C	Tp/°C	Tc/°C	ΔH /J/g	To/°C	Tp/°C	Tc/°C	ΔH /J/g
SLG	–	–	–	–				
SLG-NPs	64.03±5.31 ^c	71.18±2.98 ^c	94.27±2.85 ^d	19.87±0.04 ^a				
S-SLG-NPs	50.29±0.30 ^d	63.37±0.46 ^e	81.15±1.03 ^e	8.22±0.90 ^d				
L-SLG-NPs	75.12±0.25 ^b	90.75±0.31 ^b	97.58±0.26 ^c	3.13±0.45 ^f				
SLG-PO	79.73±0.91 ^a	97.19±0.60 ^a	106.97±1.77 ^b	9.59±1.97 ^c				
S-SLG-PO	48.02±0.12 ^d	70.66±0.48 ^d	79.88±0.21 ^f	13.95±0.04 ^b	91.26±0.58	98.31±0.02	104.16±0.59	2.41±0.45
L-SLG-PO	83.63±3.10 ^a	97.10±0.35 ^a	110.03±0.30 ^a	5.63±0.06 ^e				

Values mean \pm SD indicates the replicates of three experiments.

Values with different letters (a, b, c, d, e, and f) are significantly different ($p < 0.05$).

To, Tp, Tc, and ΔH were the onset, peak, and conclusion temperatures, and enthalpy change of gelatinization.

Table S3 Kinetic Model Parameters for Peppermint Oil (PO)-loaded Starch

Nanoparticles (SNPs)

Samples	Q _e	K	R ²
SLG-NPs	30.08	0.023	0.9984
S-SLG-NPs	33.58	0.021	0.9970
L-SLG-NPs	28.99	0.023	0.9981

Q_e: the maximal release amount of PO at infinite time; K: the rate constant of pseudo-first-order release (min⁻¹); R²: Correlation coefficients.