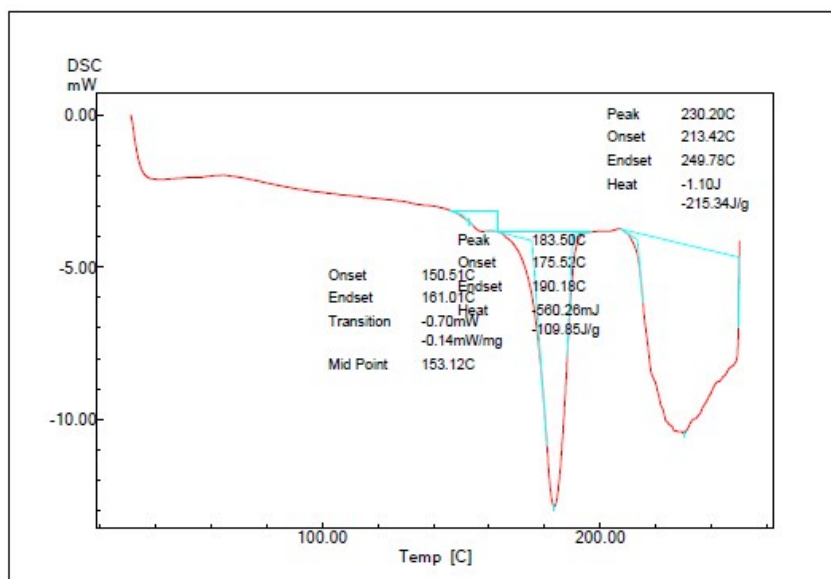
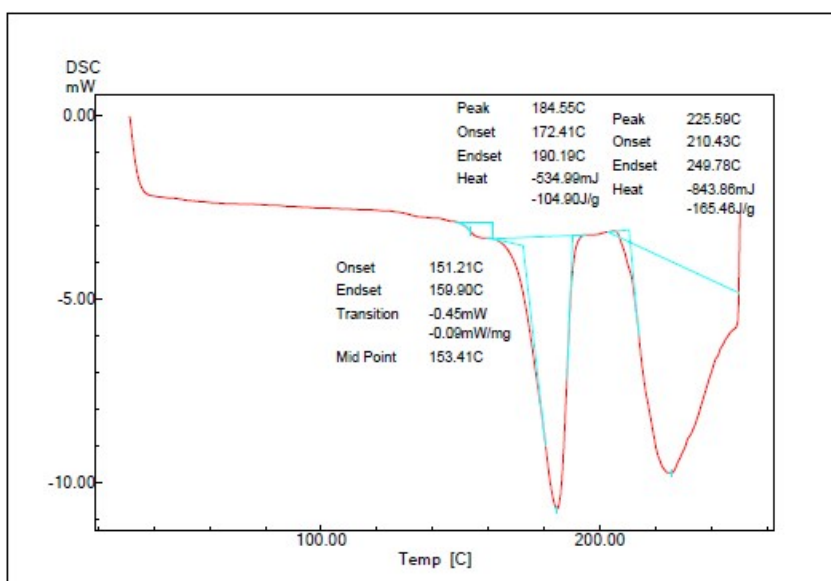


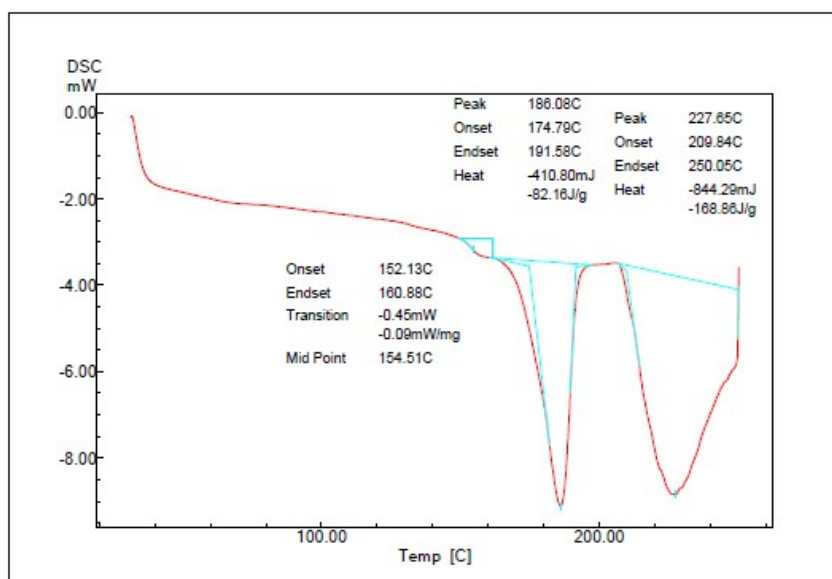
(a)



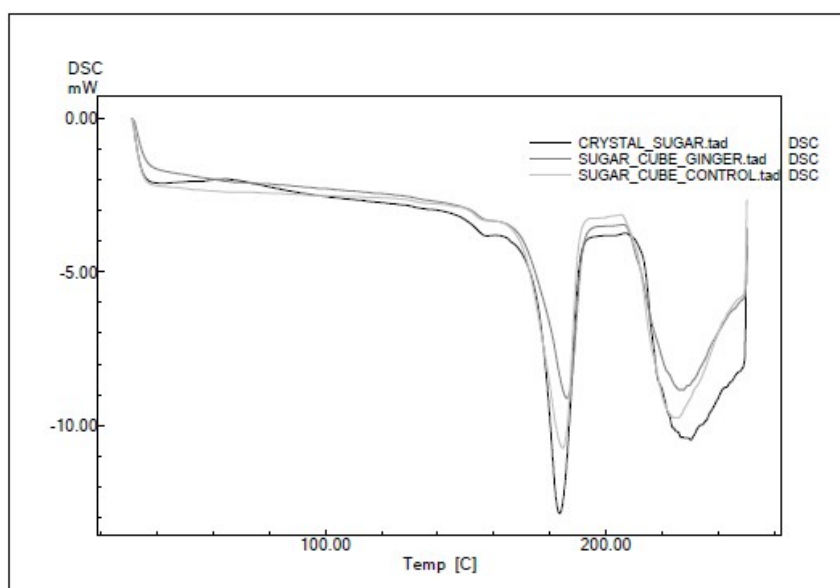
(b)



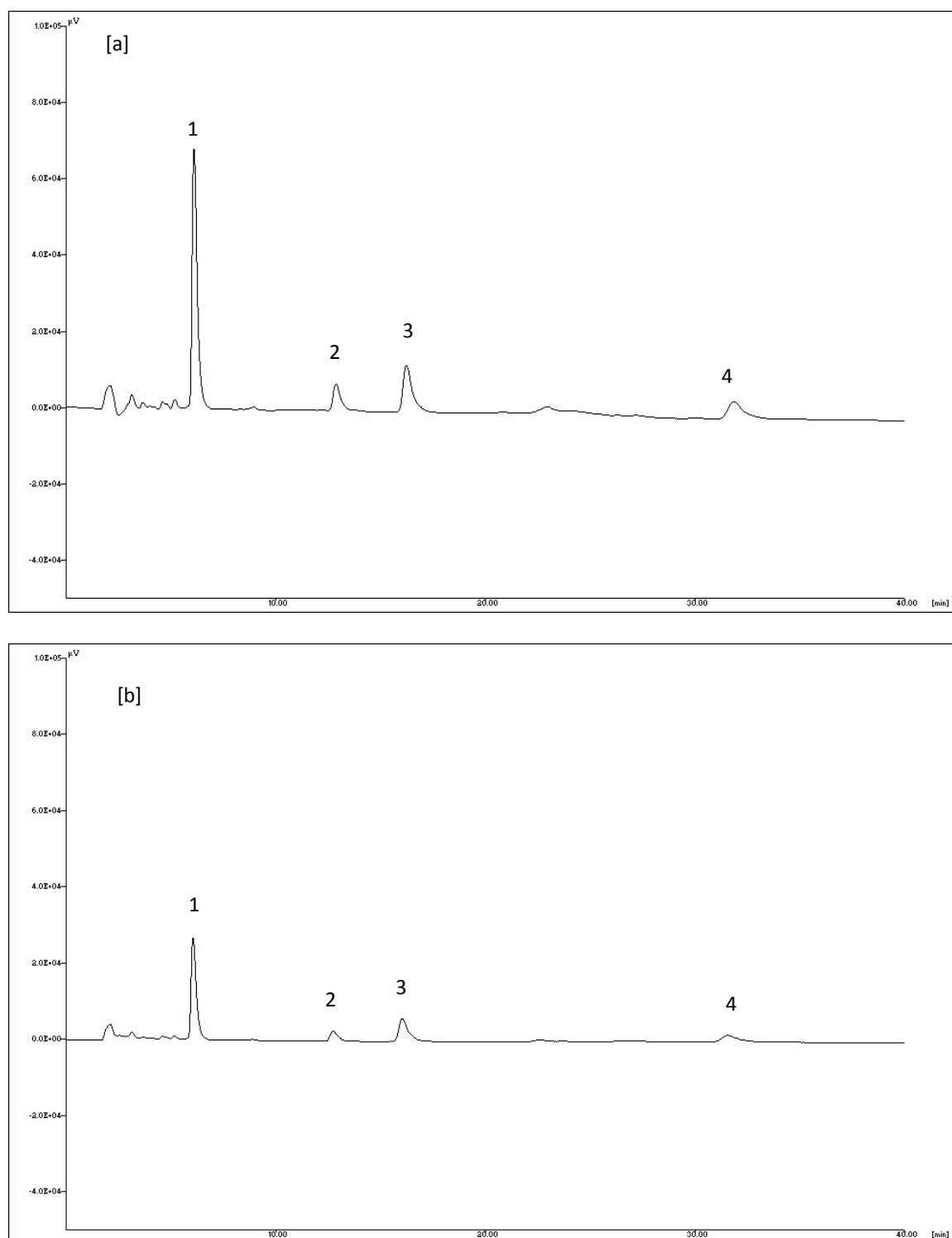
(c)



(d)



**Fig. S1.** DSC endotherms of (a) crystal sugar, (b) co-crystallized sugar cube without ginger oleoresin, (c) co-crystallized sugar cubes with ginger oleoresin, (d) overlay of the endotherms.



**Fig. S2.** HPLC chromatogram of ginger oleoresin (a) before and (b) after incorporation in sugar cubes for calculation of encapsulation efficiency; 1, 2, 3 and 4 are peaks denoting [6]-gingerol, [8]-gingerol, [10]-gingerol, and [6]-shogaol, respectively.

**Table S1.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 33% RH at 25 °C determined by HPLC

Storage time (days)	[6]-Gingerol (mg/100g)	[8]-Gingerol (mg/100g)	[10]-Gingerol (mg/100g)	[6]-Shogoal (mg/100g)
0	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>d</sup>
15	42.61 ± 0.59 <sup>ab</sup>	6.26 ± 0.00 <sup>ab</sup>	6.97 ± 0.01 <sup>a</sup>	5.95 ± 0.04 <sup>c</sup>
30	40.90 ± 1.05 <sup>b</sup>	6.12 ± 0.52 <sup>ab</sup>	5.10 ± 0.41 <sup>b</sup>	6.44 ± 0.74 <sup>c</sup>
45	36.88 ± 2.11 <sup>c</sup>	5.50 ± 0.52 <sup>bc</sup>	4.67 ± 1.42 <sup>bc</sup>	8.09 ± 0.12 <sup>b</sup>
60	36.20 ± 0.52 <sup>c</sup>	5.25 ± 0.15 <sup>bc</sup>	3.64 ± 0.26 <sup>bc</sup>	9.12 ± 0.00 <sup>ab</sup>
75	34.74 ± 3.69 <sup>c</sup>	4.32 ± 0.33 <sup>cd</sup>	3.27 ± 0.25 <sup>c</sup>	9.36 ± 1.51 <sup>a</sup>
90	30.83 ± 0.66 <sup>d</sup>	3.44 ± 0.14 <sup>d</sup>	1.77 ± 0.32 <sup>d</sup>	9.60 ± 0.09 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).

**Table S2.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 63% RH at 25 °C determined by HPLC

<b>Storage time (days)</b>	<b>[6]-Gingerol (mg/100g)</b>	<b>[8]-Gingerol (mg/100g)</b>	<b>[10]-Gingerol (mg/100g)</b>	<b>[6]-Shogoal (mg/100g)</b>
<b>0</b>	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>e</sup>
<b>15</b>	43.23 ± 1.20 <sup>b</sup>	7.01 ± 0.16 <sup>a</sup>	7.32 ± 0.27 <sup>a</sup>	5.83 ± 0.28 <sup>d</sup>
<b>30</b>	42.70 ± 0.71 <sup>b</sup>	6.57 ± 0.10 <sup>a</sup>	6.65 ± 0.57 <sup>a</sup>	6.44 ± 0.74 <sup>cd</sup>
<b>45</b>	42.13 ± 0.55 <sup>b</sup>	5.25 ± 0.32 <sup>b</sup>	4.14 ± 0.81 <sup>b</sup>	6.78 ± 0.17 <sup>c</sup>
<b>60</b>	35.64 ± 0.49 <sup>c</sup>	4.64 ± 0.16 <sup>b</sup>	3.27 ± 0.41 <sup>b</sup>	7.80 ± 0.44 <sup>b</sup>
<b>75</b>	33.80 ± 0.9 <sup>d</sup>	4.34 ± 0.85 <sup>b</sup>	3.26 ± 0.14 <sup>b</sup>	9.99 ± 0.21 <sup>a</sup>
<b>90</b>	25.89 ± 0.27 <sup>e</sup>	3.85 ± 0.31 <sup>b</sup>	3.25 ± 0.40 <sup>b</sup>	10.28 ± 0.30 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).

**Table S3.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 93% RH at 25 °C determined by HPLC

<b>Storage time (days)</b>	<b>[6]-Gingerol (mg/100 g)</b>	<b>[8]-Gingerol (mg/100 g)</b>	<b>[10]-Gingerol (mg/100 g)</b>	<b>[6]-Shogoal (mg/100 g)</b>
<b>0</b>	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>d</sup>
<b>15</b>	43.23 ± 10.13 <sup>a</sup>	6.80 ± 0.05 <sup>a</sup>	6.03 ± 0.82 <sup>b</sup>	5.18 ± 0.08 <sup>cd</sup>
<b>30</b>	43.12 ± 1.97 <sup>a</sup>	6.71 ± 0.16 <sup>a</sup>	5.39 ± 0.79 <sup>bc</sup>	6.20 ± 1.46 <sup>c</sup>
<b>45</b>	39.04 ± 0.55 <sup>a</sup>	5.20 ± 0.38 <sup>b</sup>	4.30 ± 1.09 <sup>cd</sup>	6.44 ± 0.74 <sup>c</sup>
<b>60</b>	38.42 ± 0.04 <sup>a</sup>	4.52 ± 0.26 <sup>bc</sup>	3.49 ± 0.04 <sup>de</sup>	8.05 ± 0.44 <sup>b</sup>
<b>75</b>	29.97 ± 0.99 <sup>b</sup>	4.43 ± 0.15 <sup>bc</sup>	2.68 ± 0.89 <sup>de</sup>	9.98 ± 0.76 <sup>a</sup>
<b>90</b>	27.33 ± 0.39 <sup>b</sup>	3.25 ± 0.67 <sup>d</sup>	1.98 ± 0.04 <sup>e</sup>	9.98 ± 0.24 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).

**Table S4.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 33% RH at 45 °C determined by HPLC

Storage time (days)	[6]-Gingerol (mg/100 g)	[8]-Gingerol (mg/100 g)	[10]-Gingerol (mg/100 g)	[6]-Shogoal (mg/100 g)
0	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>d</sup>
15	42.50 ± 4.30 <sup>a</sup>	7.04 ± 0.04 <sup>a</sup>	6.25 ± 0.23 <sup>b</sup>	7.57 ± 0.58 <sup>c</sup>
30	34.96 ± 0.59 <sup>b</sup>	4.82 ± 0.21 <sup>b</sup>	4.43 ± 0.47 <sup>c</sup>	8.39 ± 0.36 <sup>c</sup>
45	33.42 ± 0.55 <sup>bc</sup>	4.76 ± 0.25 <sup>b</sup>	3.94 ± 0.59 <sup>cd</sup>	9.74 ± 0.29 <sup>b</sup>
60	31.98 ± 0.58 <sup>bc</sup>	4.11 ± 0.09 <sup>bc</sup>	3.09 ± 0.50 <sup>cde</sup>	11.38 ± 0.30 <sup>a</sup>
75	30.79 ± 1.43 <sup>c</sup>	3.71 ± 0.24 <sup>bc</sup>	2.63 ± 0.43 <sup>de</sup>	11.67 ± 1.21 <sup>a</sup>
90	26.55 ± 0.54 <sup>d</sup>	2.84 ± 0.71 <sup>c</sup>	2.09 ± 0.51 <sup>e</sup>	11.73 ± 0.18 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).

**Table S5.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 63% RH at 45 °C determined by HPLC

Storage time (days)	[6]-Gingerol (mg/100 g)	[8]-Gingerol (mg/100 g)	[10]-Gingerol (mg/100 g)	[6]-Shogoal (mg/100 g)
0	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>d</sup>
15	42.95 ± 3.34 <sup>a</sup>	6.46 ± 1.07 <sup>a</sup>	5.68 ± 0.89 <sup>b</sup>	5.99 ± 0.38 <sup>c</sup>
30	33.70 ± 0.79 <sup>b</sup>	4.60 ± 0.83 <sup>b</sup>	4.14 ± 0.78 <sup>c</sup>	6.44 ± 0.74 <sup>c</sup>
45	32.86 ± 4.11 <sup>b</sup>	4.034 ± 0.23 <sup>b</sup>	3.13 ± 0.18 <sup>cd</sup>	9.02 ± 0.50 <sup>b</sup>
60	32.59 ± 0.18 <sup>b</sup>	4.01 ± 0.79 <sup>b</sup>	2.77 ± 0.44 <sup>cd</sup>	10.71 ± 1.80 <sup>ab</sup>
75	26.57 ± 1.37 <sup>c</sup>	3.80 ± 0.46 <sup>b</sup>	2.43 ± 0.63 <sup>d</sup>	11.08 ± 1.58 <sup>a</sup>
90	25.42 ± 0.16 <sup>c</sup>	3.21 ± 0.09 <sup>b</sup>	1.92 ± 0.17 <sup>d</sup>	11.13 ± 0.46 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).



**Table S6.** Degradation of [6], [8], [10]-gingerols and formation of [6]-shogoal in ginger flavoured co-crystallized sugar cubes under storage of 63% RH at 45 °C determined by HPLC

Storage time (days)	[6]-Gingerol (mg/100 g)	[8]-Gingerol (mg/100 g)	[10]-Gingerol (mg/100 g)	[6]-Shogoal (mg/100 g)
0	45.57 ± 1.23 <sup>a</sup>	7.13 ± 1.70 <sup>a</sup>	7.78 ± 1.64 <sup>a</sup>	3.88 ± 0.64 <sup>c</sup>
15	43.23 ± 10.13 <sup>a</sup>	6.34 ± 0.11 <sup>ab</sup>	6.04 ± 0.62 <sup>b</sup>	7.29 ± 0.40 <sup>b</sup>
30	41.01 ± 1.26 <sup>a</sup>	5.39 ± 0.80 <sup>bc</sup>	4.70 ± 0.93 <sup>bc</sup>	8.01 ± 3.21 <sup>b</sup>
45	32.59 ± 0.18 <sup>b</sup>	4.53 ± 0.57 <sup>c</sup>	3.91 ± 0.26 <sup>cd</sup>	9.72 ± 0.39 <sup>ab</sup>
60	32.12 ± 1.28 <sup>b</sup>	4.46 ± 0.40 <sup>c</sup>	3.88 ± 0.77 <sup>cd</sup>	10.81 ± 0.30 <sup>a</sup>
75	28.04 ± 3.17 <sup>bc</sup>	3.95 ± 0.45 <sup>c</sup>	2.81 ± 0.80 <sup>d</sup>	10.84 ± 1.29 <sup>a</sup>
90	23.17 ± 0.41 <sup>c</sup>	2.54 ± 0.39 <sup>d</sup>	1.24 ± 0.52 <sup>e</sup>	11.25 ± 0.61 <sup>a</sup>

Values in same column with different letters are significantly different (P≤0.05).