

Supporting Information

Green preparation of holocellulose nanocrystals from burdock and their inhibitory effects against α -Amylase and α -Glucosidase

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Table S1. Monosaccharide composition of burdock IDF and *hCNCs*.

Samples	Monosaccharide composition									
	Glucose (%)	Fucose (%)	Rhamnose (%)	Xylose (%)	Mannose (%)	Fructose (%)	Arabinose (%)	Galactose (%)	Galacturonic acid (%)	Glucuronic acid (%)
IDF	59.04 ± 1.36 a	0.53 ± 0.03 c	3.24 ± 0.25 d	10.63 ± 0.59 c	1.69 ± 0.27 c	0.63 ± 0.10	10.06 ± 1.17 c	4.37 ± 0.32 c	9.45 ± 0.59 c	0.36 ± 0.06 b
<i>hCNC</i> -600	62.66 ± 1.87 b	0.19 ± 0.02 b	2.21 ± 0.17 c	6.70 ± 0.23 a	1.45 ± 0.04 b	ND	12.88 ± 0.21 d	3.27 ± 0.12 c	10.17 ± 1.03 d	0.49 ± 0.02 c
<i>hCNC</i> -400	64.23 ± 2.23 b	0.15 ± 0.01 a	1.43 ± 0.12 b	15.71 ± 0.34 d	1.44 ± 0.12 b	ND	8.74 ± 0.65 b	2.23 ± 0.17 b	5.77 ± 0.23 b	0.30 ± 0.02 a
<i>hCNC</i> -300	71.92 ± 1.76 c	0.16 ± 0.02 a	1.09 ± 0.07 a	10.38 ± 0.43 c	1.62 ± 0.21 c	ND	7.72 ± 0.87 a	1.81 ± 0.22 a	5.06 ± 0.21 a	0.25 ± 0.03 a
<i>hCNC</i> -200	72.59 ± 2.23 c	0.16 ± 0.01 a	1.19 ± 0.13 a	9.71 ± 0.43 b	1.28 ± 0.17 a	ND	7.31 ± 0.29 a	1.87 ± 0.21 a	5.62 ± 0.32 b	0.27 ± 0.04 a

ND: not detected.

Different lowercase letters in the same column represent significant differences in chemical composition ($P < 0.05$).

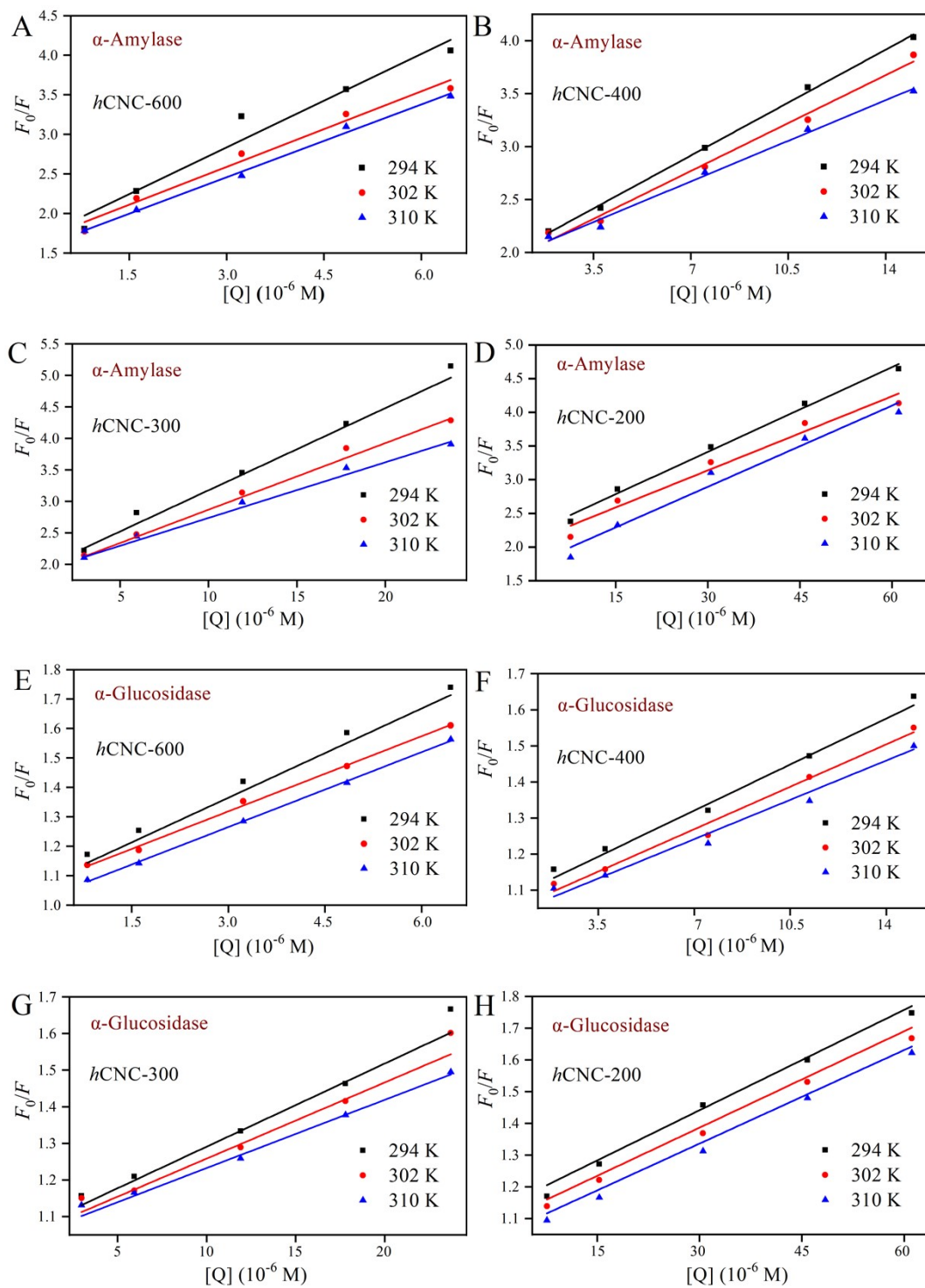


Fig. S1. Stem-Volmer plots describing α -Amylase (a-d) and α -Glucosidase (e-h) quenching induced by *hCNC-600*, *hCNC-400*, *hCNC-300*, and *hCNC-200* at different temperatures.

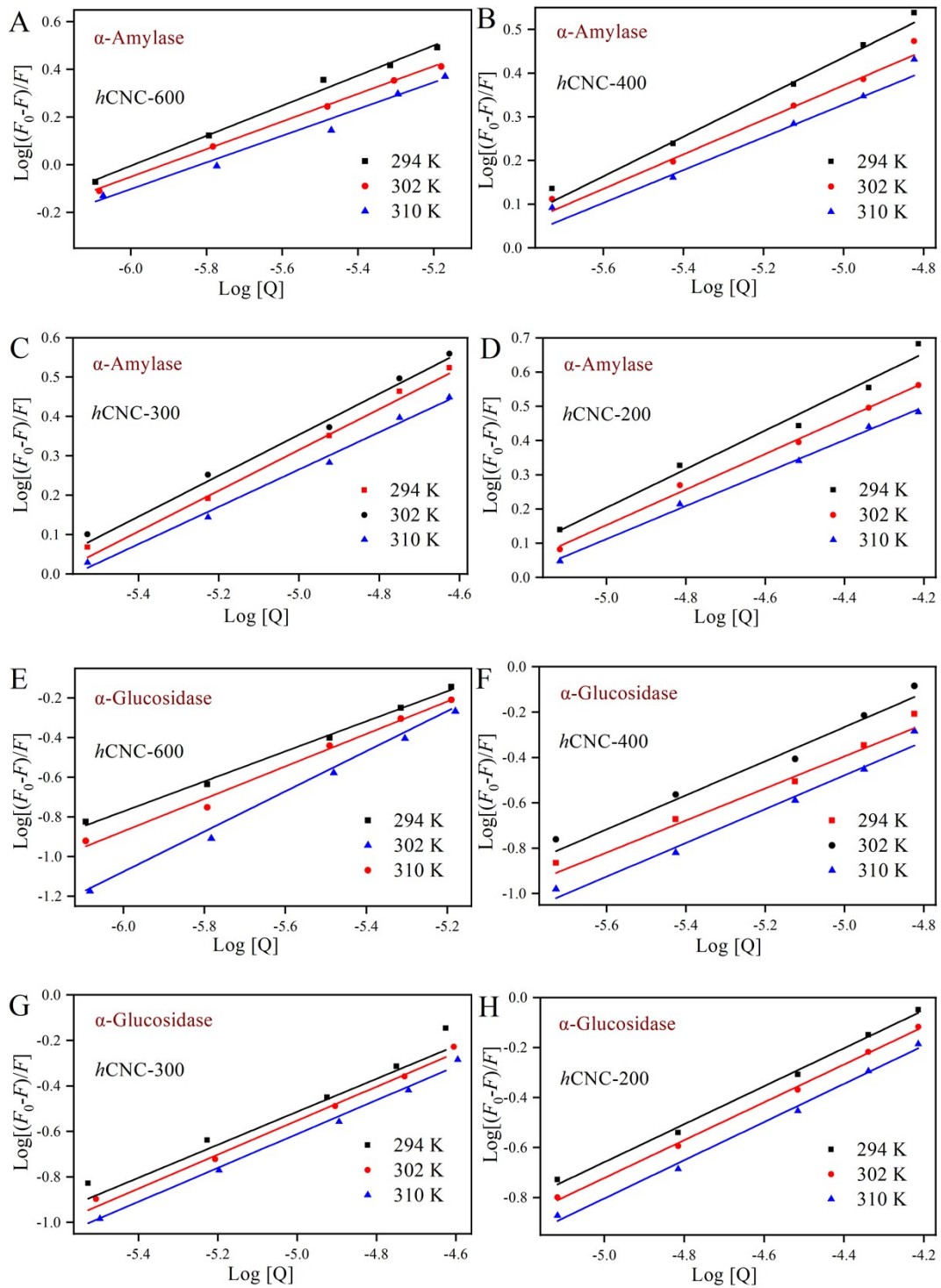


Fig. S2. The plots of log of $(F_0 - F)/F$ versus log $[Q]$ for the interactions between hCNCs and α -Amylase (a-d) or α -Glucosidase binding (e-h) at different temperatures.

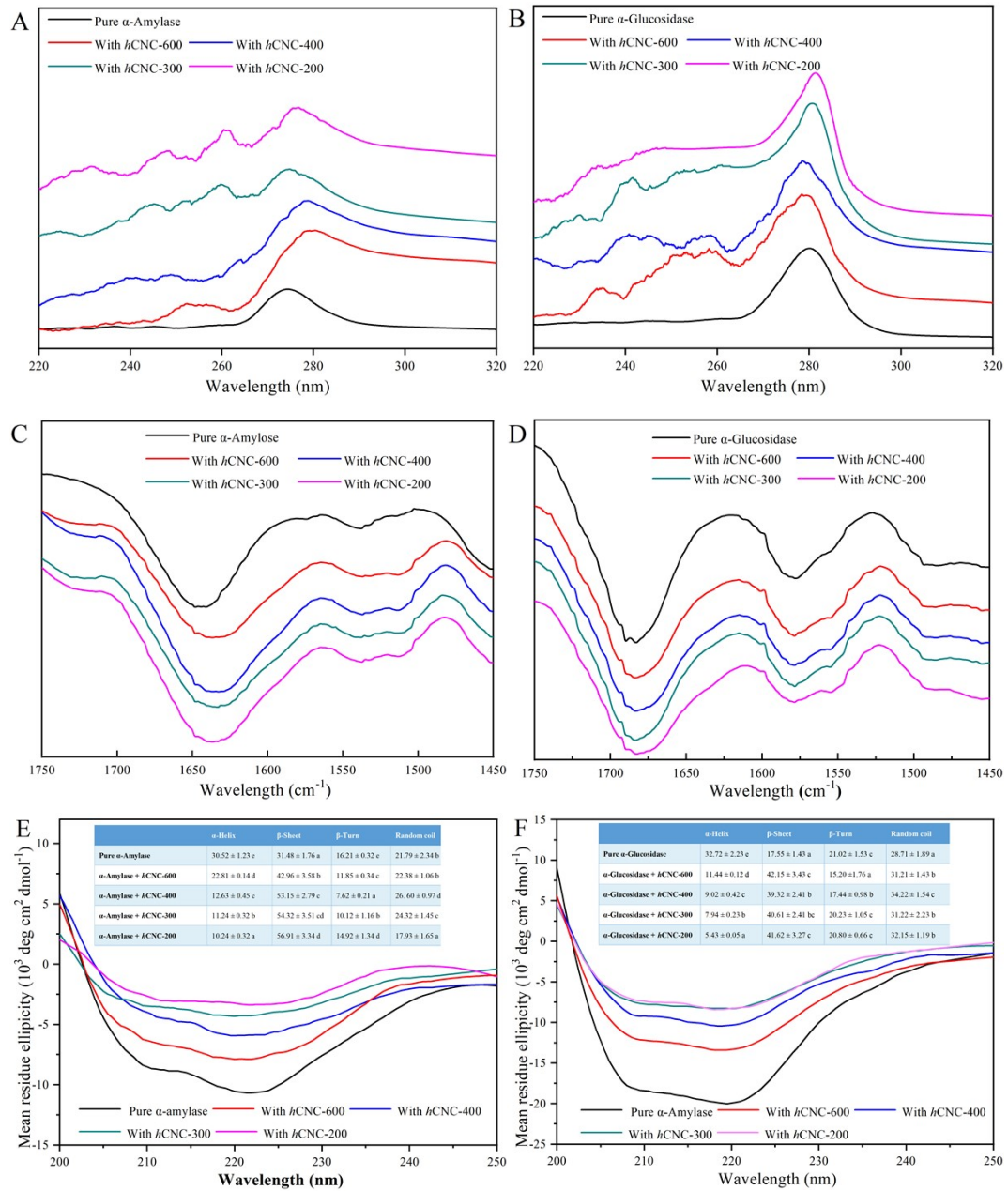


Fig. S3. The UV-Vis spectra (a, b), FT-IR spectra (c, d), and CD spectra (e, f) of pure α -Amylase or α -Glucosidase and in the presences of different hCNCs. The composition of the secondary structure was summarized in the sets in e and f, and different lowercase letters in the same column represent significant differences ($P < 0.05$).

Table S2. Kinetic parameters for α -Amylase inhibition in the presence of different *hCNCs*. Different lowercase letters in the same column represent significant differences ($P < 0.05$).

Sample	V_{\max} ($\Delta A540/\text{min}$)	K_m (mM)	R^2	Inhibition type
Control	0.107 \pm 0.012 g	2.451 \pm 0.023 c	0.991	
0.5 mg/ml of <i>hCNC</i> -600	0.080 \pm 0.002 f	2.446 \pm 0.109 c	0.997	Noncompetitive
1.0 mg/ml of <i>hCNC</i> -600	0.066 \pm 0.001 c	2.495 \pm 0.056 c	0.993	
0.5 mg/ml of <i>hCNC</i> -400	0.069 \pm 0.002 d	2.118 \pm 0.214 b	0.999	Uncompetitive and noncompetitive
1.0 mg/ml of <i>hCNC</i> -400	0.051 \pm 0.003 a	1.956 \pm 0.102 a	0.999	
0.5 mg/ml of <i>hCNC</i> -300	0.075 \pm 0.004 e	2.497 \pm 0.051 c	0.997	Noncompetitive
1.0 mg/ml of <i>hCNC</i> -300	0.056 \pm 0.003 b	2.483 \pm 0.129 c	0.988	
0.5 mg/ml of <i>hCNC</i> -200	0.073 \pm 0.006 e	2.830 \pm 0.129 d	0.994	Competitive and noncompetitive
1.0 mg/ml of <i>hCNC</i> -200	0.063 \pm 0.005 c	3.125 \pm 0.059 e	0.999	

Table S3. Kinetic parameters of α -Glucosidase inhibition in the presence of different *hCNCs*. Different lowercase letters in the same column represent significant differences ($P < 0.05$).

Sample	V_{\max} ($\Delta A_{405}/\text{min}$)	K_m (mM)	R^2	Inhibition type
Control	0.198 \pm 0.012 h	10.09 \pm 0.323 h	0.991	
0.5 mg/ml of <i>hCNC</i> -600	0.086 \pm 0.003 d	3.963 \pm 0.213 b	0.996	
1.0 mg/ml of <i>hCNC</i> -600	0.063 \pm 0.010 b	3.445 \pm 0.123 a	0.995	
0.5 mg/ml of <i>hCNC</i> -400	0.071 \pm 0.002 c	4.332 \pm 0.243 c	0.999	Uncompetitive and noncompetitive
1.0 mg/ml of <i>hCNC</i> -400	0.051 \pm 0.003 a	3.562 \pm 0.156 a	0.996	
0.5 mg/ml of <i>hCNC</i> -300	0.148 \pm 0.021 g	8.785 \pm 0.231 g	0.992	
1.0 mg/ml of <i>hCNC</i> -300	0.113 \pm 0.003 e	7.613 \pm 0.413 f	0.996	
0.5 mg/ml of <i>hCNC</i> -200	0.129 \pm 0.012 f	6.081 \pm 0.254 e	0.997	
1.0 mg/ml of <i>hCNC</i> -200	0.089 \pm 0.004 d	4.963 \pm 0.189 d	0.997	