

Supplementary Information

Preparation of novel magnetic cellulose nanocrystal and its efficient use for enzyme immobilization

Shi-lin Cao ^{a,b}, Xue-Hui Li ^a, Wen-Yong Lou ^{b,c*} and Min-Hua Zong ^{a,c*}

1 Supplementary Table

5

Table S1 The preparation conditions of the MCNCs.

Sample	W(FeCl ₂ •4H ₂ O)(g)	W(FeCl ₃ •6H ₂ O)(g)	W(Chitosan)(g)	W(TPP)(g)
MCNC-1	1.34	3.40	0.60	1.20
MCNC-2	2.68	6.80	0.60	1.20
MCNC-3	2.68	6.80	1.20	2.40
MCNC-4	5.36	13.60	0.60	1.20
MCNC-5	5.36	13.60	0.15	0.30
MCNC-6	5.36	13.60	2.40	4.80

Table S2 TGA and VSM results of the MCNCs.

Sample	Weight loss (%)	Fe ₃ O ₄ content (%)	M _s (emu/g)
MCNC-1	69.5	16.9	0.74
MCNC-2	65.5	24.6	1.06
MCNC-3	66.3	18.7	1.19
MCNC-4	59.0	34.2	5.91
MCNC-5	57.3	40.7	16.72
MCNC-6	55.8	24.5	0.44

10

Table S3 Assay of biocompatibility of MCNCs with papain ^a.

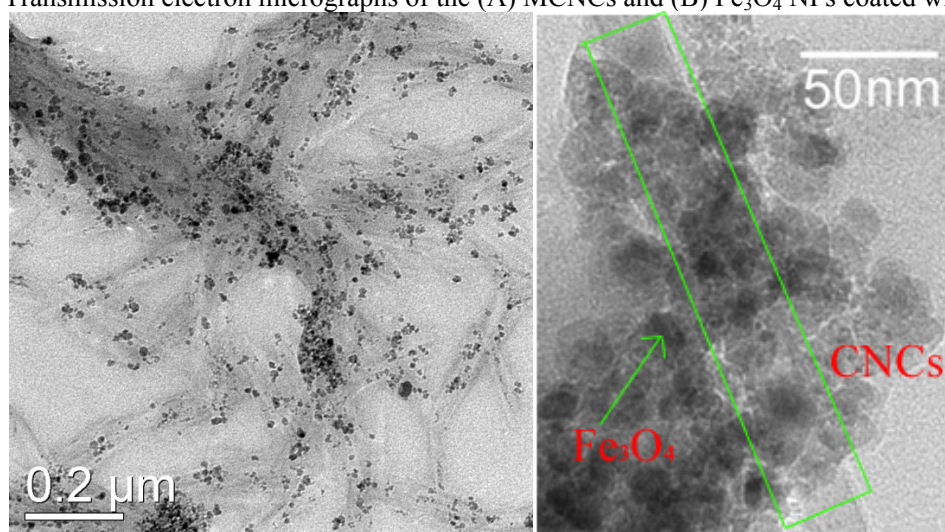
Sample	Amount of MCNCs (mg)	Relative activity of papain (%)
1	0	100.0
2	25	99.2
3	50	98.6
4	75	98.0
5	100	97.2
6	125	96.7
7	150	96.1

^a 0.9 mg of papain were incubated with 0-150 mg of MCNCs for 1 hour, then the MCNCs were removed from the solution via magnetic separation, and the relative activities were determined by method mentioned at Section 2.5 at 60°C, pH 6.5.

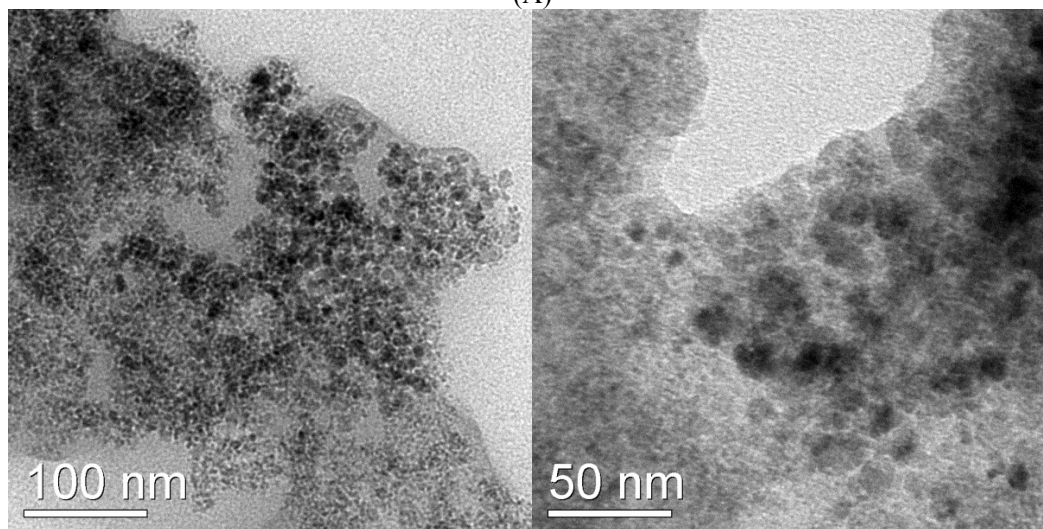
5

2 Supplementary Figure

10 **Figure S1** Transmission electron micrographs of the (A) MCNCs and (B) Fe₃O₄ NPs coated with chitosan.^a



(A)

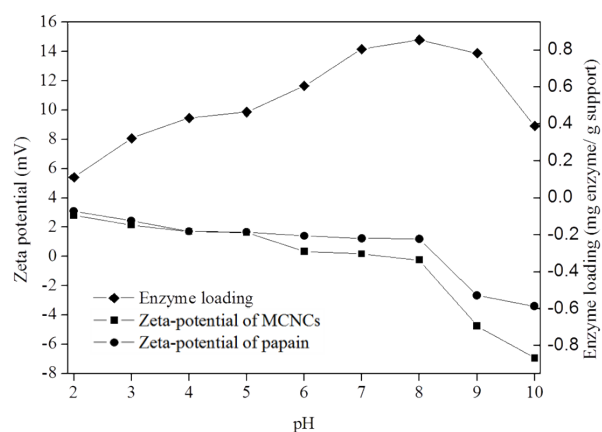


(B)

15 ^a: Transmission electron microscopy micrographs were obtained by a JEOL JEM-2010 TEM operating at 200kV. A 10 μL drop of well-dispersed MCNCs suspension was dried on a 300 mesh Support Film on Double Folding Grids (Beijing Zhongjingkeyi Technology Co., Ltd., China) and analyzed.

20

Figure S2 Effect of buffer pH on papain loading via electrostatic interactions onto MCNCs^a.



^a: To be specific, 1 g MCNCs were dispersed in 20 mL 0.05M PBS (pH from 2 to 10) containing 9 mg of papain at 4 °C for 18 h. The unloading papain was removed by washing with distilled water until no protein was detected by Bradford method. The resulting solutions were combined to detect the amount of unloading papain. The amount of papain loaded on the MCNCs in the absence of formaldehyde could be calculated as the difference between the amount of the initial and the unloading papain.