Highly-efficient removal of Cu(II) by novel dendritic polyamine-pyridine grafted chitosan beads from complicated wastewater with salt and acid

Li-Li Wang [a], Chen Ling [b], Bang-Sen Li [a], Da-Shuai Zhang [a], Chen Li [a], Xiao-Peng Zhang [a,] *, Zai-Feng Shi [a,] *

[a]*College of Chemistry and Chemical Engineering, Key Laboratory of Water Pollution Treatment & Resource Reuse of Hainan Province, Hainan Normal University, Haikou 571158, P.R. China*

[b]*College of Biology and the Environment, Nanjing Forestry University, Nanjing 210037, China*

* Corresponding author.

E-mail address: xpzhang@hainnu.edu.cn (X.-P. Zhang)

* Corresponding author.

E-mail address: zaifengshi@163.com (Z.-F. Shi)

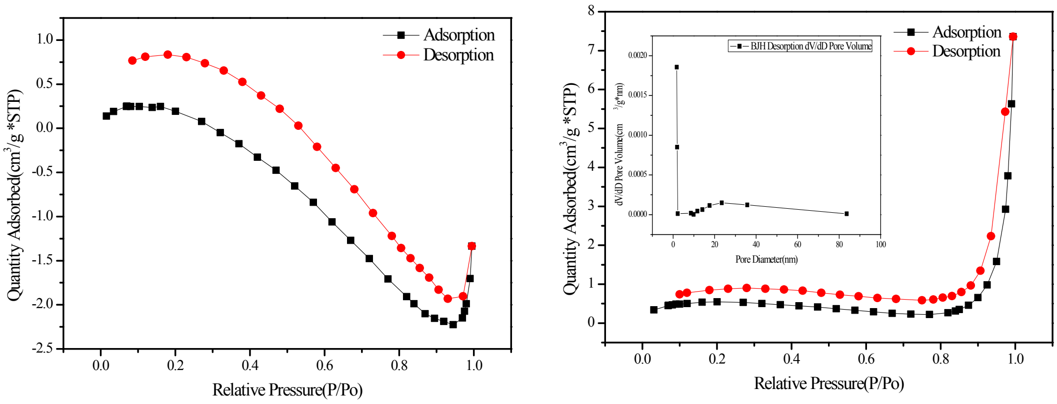

Fig. S1 Nitrogen adsorption-desorption isotherm and pore size distribution of CN (left) and CNP (right)

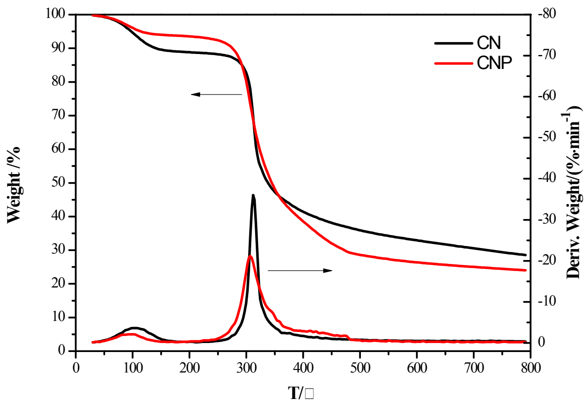

Fig. S2 TG and DSC curves of CN and CNP

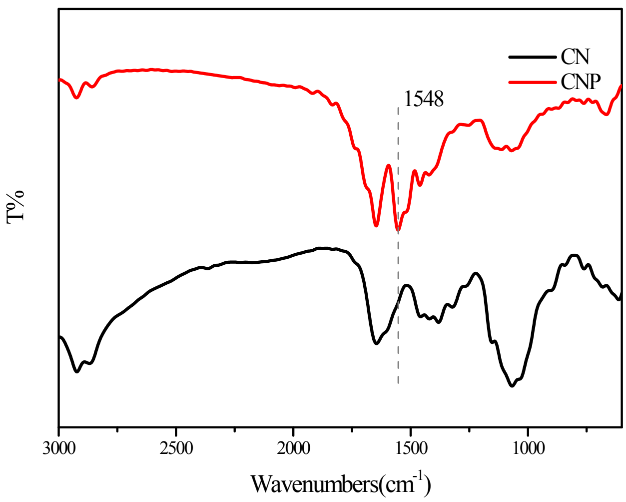

Fig. S3 FTIR spectra of CN and CNP

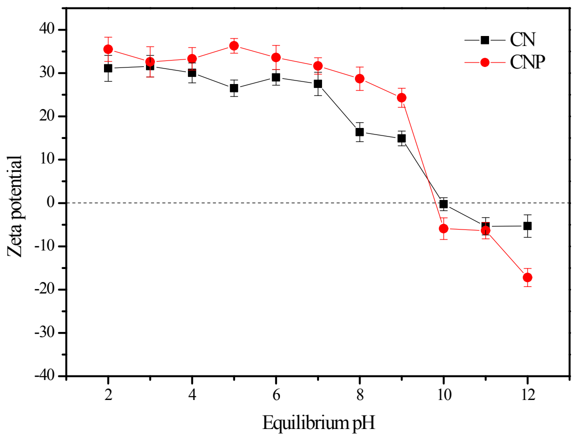

Fig. S4 Zeta potentials of CN and CNP.

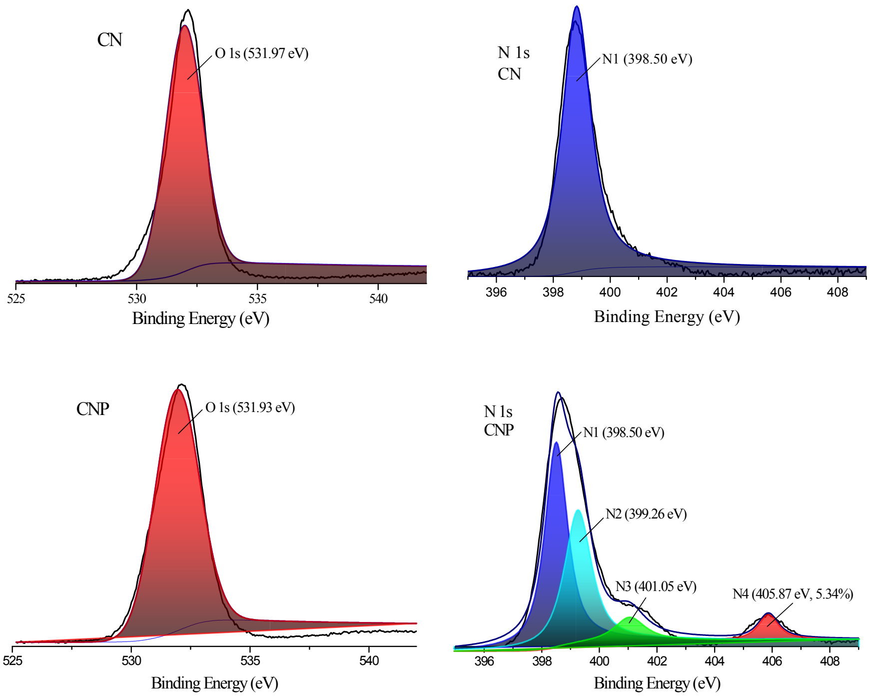

Fig. S5 XPS spectra of CN and CNP.

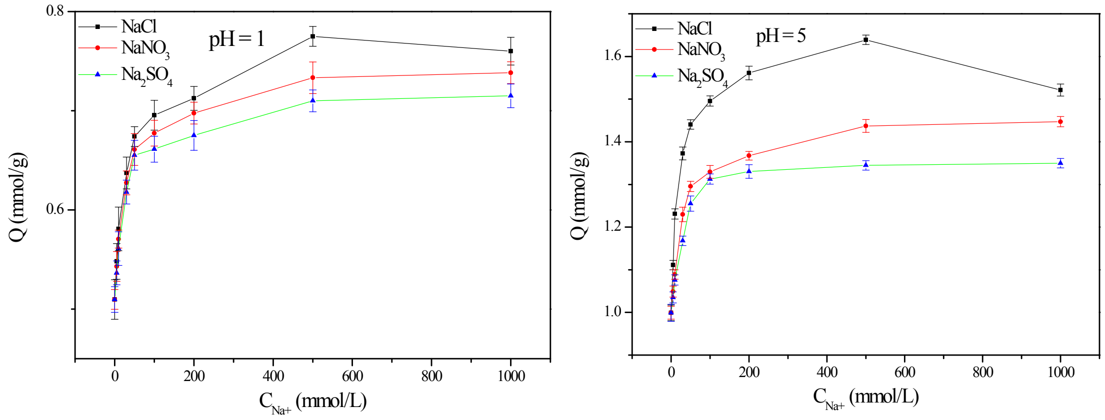

Fig. S6 Adsorption amounts of Cu(II) in salty systems with different concentrations of Na^+ salts.

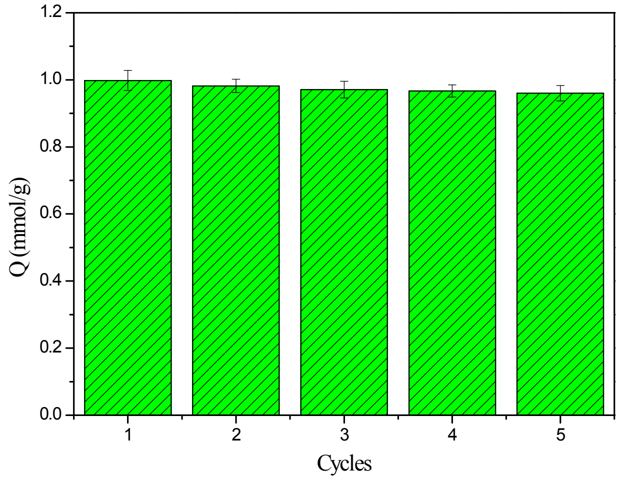

Fig. S7 Regeneration and reuse of CNP with 15% HCl.

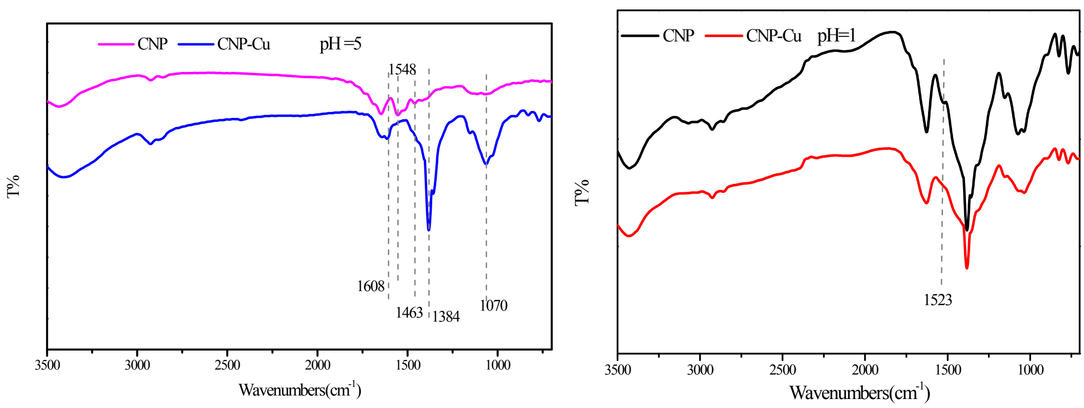

Fig. S8 FTIR spectra of CNP before and after adsorbing Cu(II).

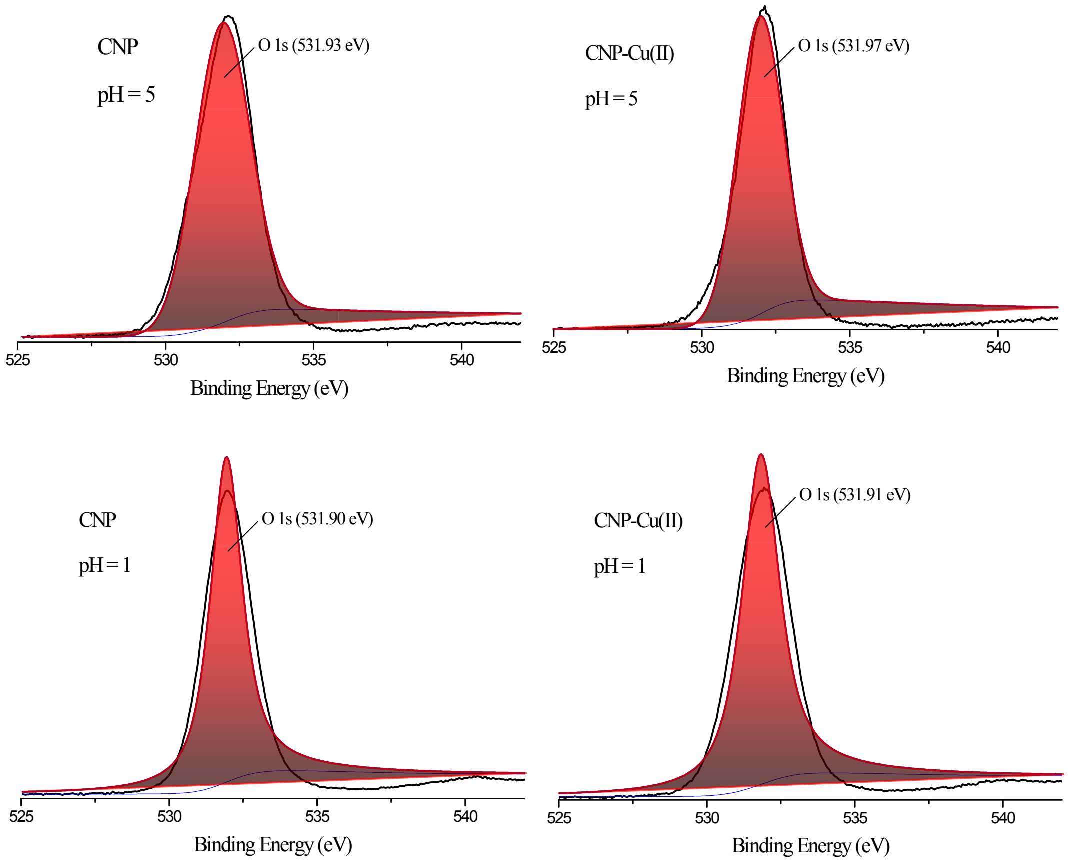

Fig. S9 XPS spectra (O 1s) of CNP before and after adsorbing Cu(II).

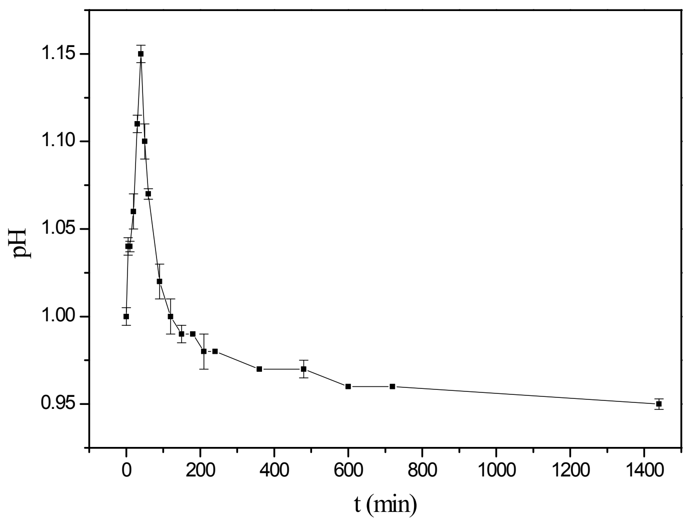

Fig. S10 Time course of pH at the original pH = 1.

Table S1 Fitting parameters of isotherm models for Cu(II)

ions	**pH**	**Langmuir equation**			**Freundlich equation**		
		Q_m	b	R_L^2	K_f	n	R_F^2
Cu(II)	5	1.93	2.07	0.9926	1.235	3.644	0.9748
Cu(II)	1	0.98	1.43	0.9972	0.577	3.603	0.9668

Table S2 Comparison of adsorption performance between CNP and reported polyamine adsorbents

Adsorbent	Simulated maximum capacity	reference
CNP	$Q_{Cu(II)}$ = 1.93 mmol/g, pH =5	In this study
	$Q_{Cu(II)}$ = 0.98 mmol/g, pH =1	
Si-AMP-M-H	$Q_{Cu(II)}$ = 0.78 mmol/g, pH =4	[1]
PAPY	$Q_{Ni(II)}$ = 1.48 mmol/g, pH =2	[2]
	$Q_{Co(II)}$ = 0.90 mmol/g, pH =2	
PEI + tannic acid/alginate sorbent	$Q_{Cu(II)}$ = 1.36 mmol/g, pH =4	[3]
CEAD	$Q_{Cu(II)}$ = 1.35 mmol/g, pH =4	[4]
EDTB	$Q_{Cu(II)}$ = 1.74 mmol/g, pH =4	[5]
M4195	$Q_{Cu(II)}$ = 0.78 mmol/g, pH = 1	[6]
LDH-PP@TA	$Q_{Cu(II)}$ = 0.92 mmol/g, pH = 7	[7]
NFC/PEI	$Q_{Cu(II)}$ = 2.74 mmol/g, pH = 5	[8]
D001-PEI	$Q_{Cu(II)}$ = 1.55 mmol/g, pH = 5	[9]
amine-functionalized SBA-15	$Q_{Cu(II)}$ = 0.54 mmol/g, pH = 5	[10]
polystyrene-supported 2-aminomethylpyridine chelating resin	$Q_{Cu(II)}$ = 1.53 mmol/g, pH = 4	[11]

Table S3 Kinetic rate parameters for the adsorption of Cu(II) at pH = 5 and 1.

pH	pseudo-first-order kinetics			pseudo-second-order kinetics		
	k_1	Q_e	r^2	k_2	Q_e	r^2
5	0.00463	0.90932	0.9779	0.00439	1.10831	0.99128
1	0.00873	0.5221	0.98945	0.01643	0.61023	0.99134

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