

## *Supplementary Information*

### **pH-responsive Chitosan-based Flocculant for Precise Dye Control Flocculation and the Recycling of Textile Dyeing Effluents**

*Tingting Wei<sup>a</sup>, Liang Wu<sup>b</sup>, Feng Yu<sup>a</sup>, Yin Lv<sup>a</sup>, Long Chen<sup>a</sup>, Yulin Shi<sup>a\*</sup>, Bin Dai<sup>a\*</sup>*

<sup>a</sup>Key Laboratory for Green Processing of Chemical Engineering of Xinjiang Bingtuan, School of Chemistry and Chemical Engineering, Shihezi University, Shihezi 832003, P.R. China.

<sup>b</sup>Chongqing Daxin Pharmaceutical Co., Ltd, Chongqing 400714, P.R. China.

E-mail: shiyulin@shzu.edu.cn (Y. L. Shi); Db\_tea@shzu.edu.cn (B. Dai)

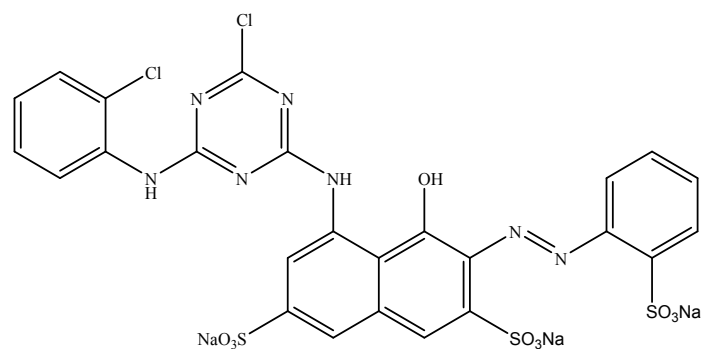


Fig. S1 Chemical structure of K-2BP

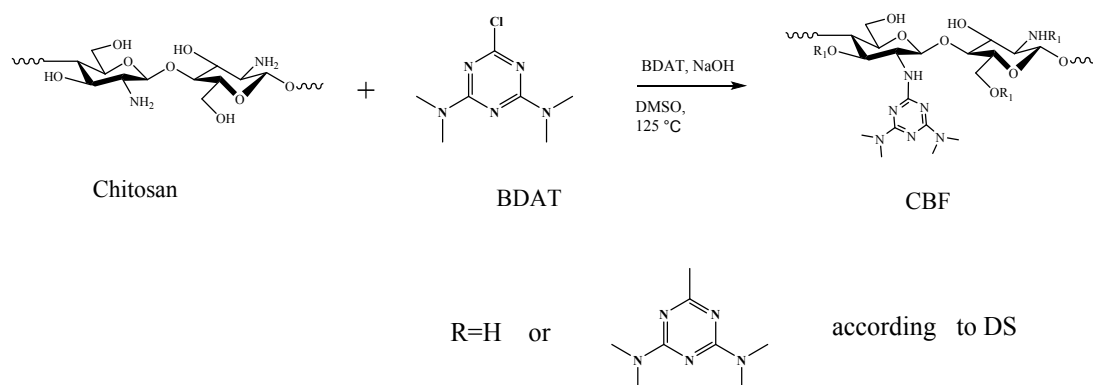


Fig. S2 The synthesis route to prepare CBF by etherification of chitosan with 2,4-bis(dimethylamino)-6-chloro-[1,3,5]-triazine (BDAT).

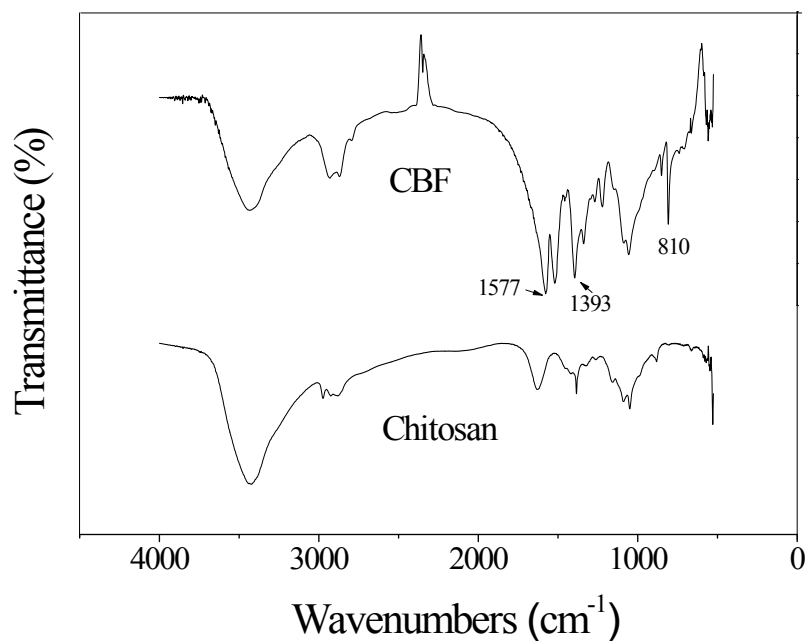


Fig. S3 FTIR spectra of chitosan and CBF.

The FT-IR spectrum of CBF showed three new and strong absorption peaks at 1577 cm<sup>-1</sup>, 1393 cm<sup>-1</sup>, and 810 cm<sup>-1</sup>, which were the characteristic adsorptions of the s-triazine ring<sup>1</sup>.

Table S1 Quantitative elemental analysis of chitosan and CBF

Sample	C (%)	H (%)	N (%)
Chitosan	37.92	7.08	7.18
CBF	40.11	7.01	19.50

## 2. Experimental section

### S2.3 Azo dye flocculation and sludge floc preparation

Dye removal experiments was conducted using batch tests for the flocculation of dye from water. A flocculant solution (1 g L<sup>-1</sup>) was prepared by dissolving CBF powder in a dilute hydrochloric acid (2 wt%). 30 mL of dye stock solution (200 mg L<sup>-1</sup>) was added into a glass beaker (100 mL) and then a

measured volume of 0.3 - 50 mL of flocculant solution was added. The final volume of dye solution was 80 mL by addition of water. The mixture in the jar was stirred at 150 rpm for 10 min, and the flocs were allowed to settle for 30 min and separated by filtration.

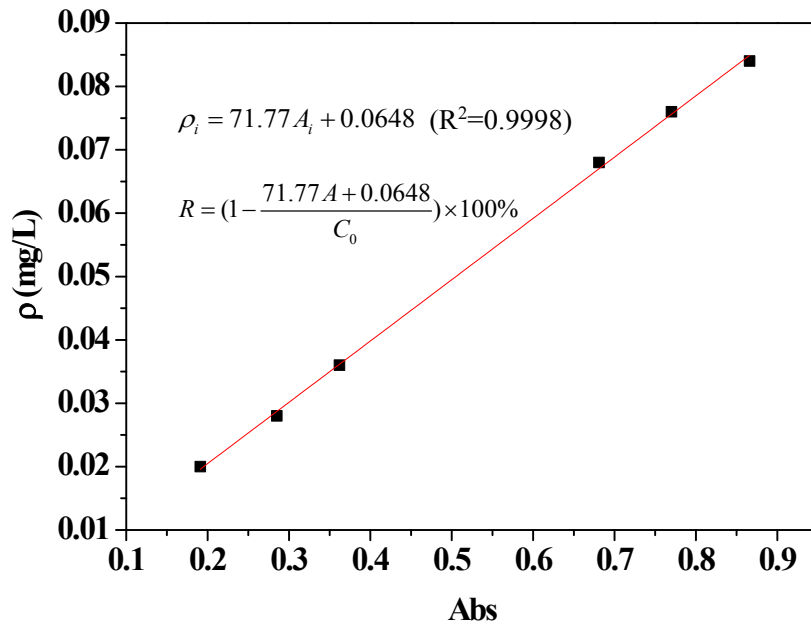


Fig. S4 Standard curve of K-2BP

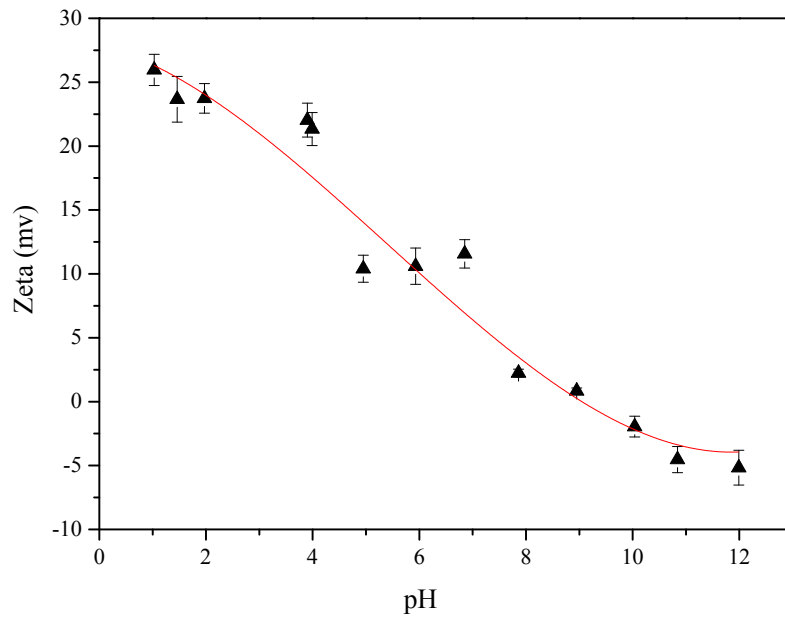


Fig. S5 Zeta potential of CBF dispersions at different pH values

Table S2 Porous property calculated from N<sub>2</sub> adsorption–desorption isotherms

Sample	S <sub>BET</sub> (m <sup>2</sup> g <sup>-1</sup> )	Pore volume (cm <sup>3</sup> g <sup>-1</sup> )	Mesopore size (nm)	micropore size (nm)
CBF-N-0.5	73.2	0.0845	5.092	0.848
CBF-N-0.9	163.7	0.118	3.393	0.832
CBF-N-1.5	440.4	0.144	2.57	0.582
CBF-N-2	649.5	0.142	2.27	0.519

Table S3 The elemental analysis of CBF-N-x

Sample	C (wt.%)	H (wt.%)	N (wt.%)
CBF-N-0.5	64.57	2.17	6.58
CBF-N-0.9	72.56	2.58	7.19
CBF-N-1.5	72.60	1.63	9.57
CBF-N-2	72.43	1.96	8.50

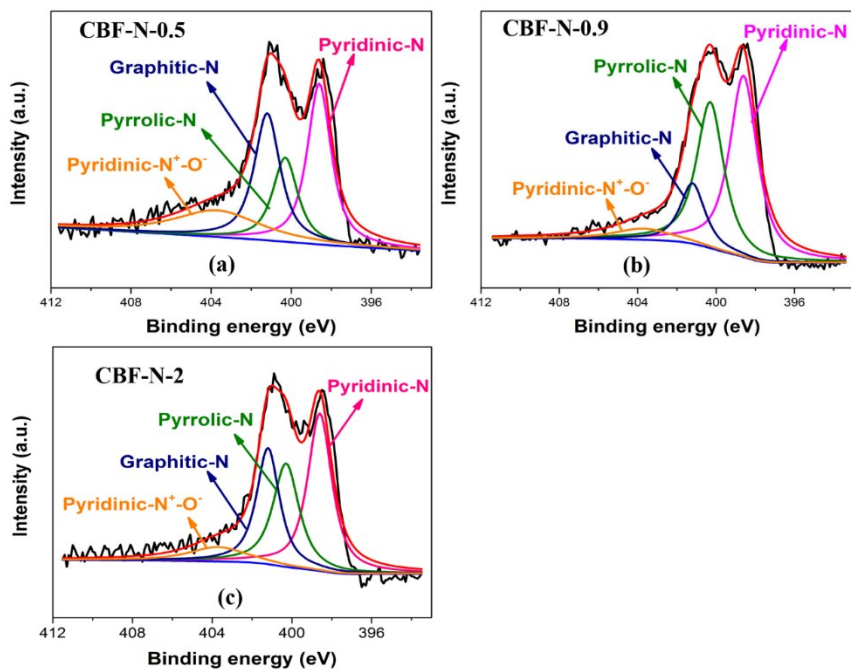


Figure S6. XPS deconvoluted spectra of N1s peak of CBF-N-0.5 (a), CBF-N-0.9 (b) and CBF-N-2(c).

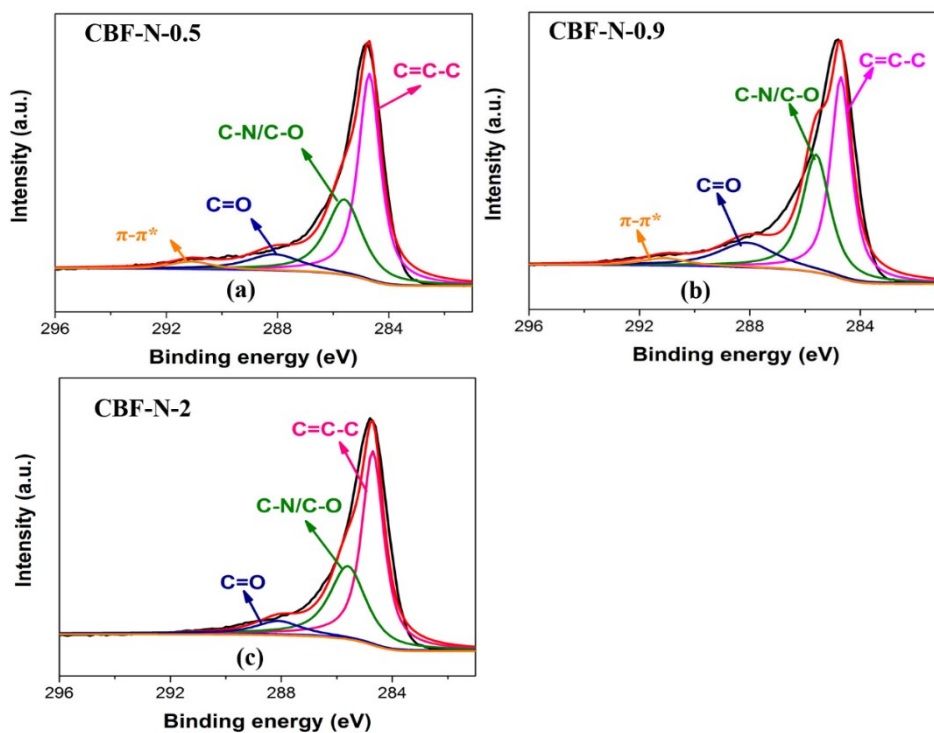


Figure S7. XPS deconvoluted spectra of C1s peak of CBF-N-0.5 (a), CBF-N-0.9 (b) and CBF-N-2(c).

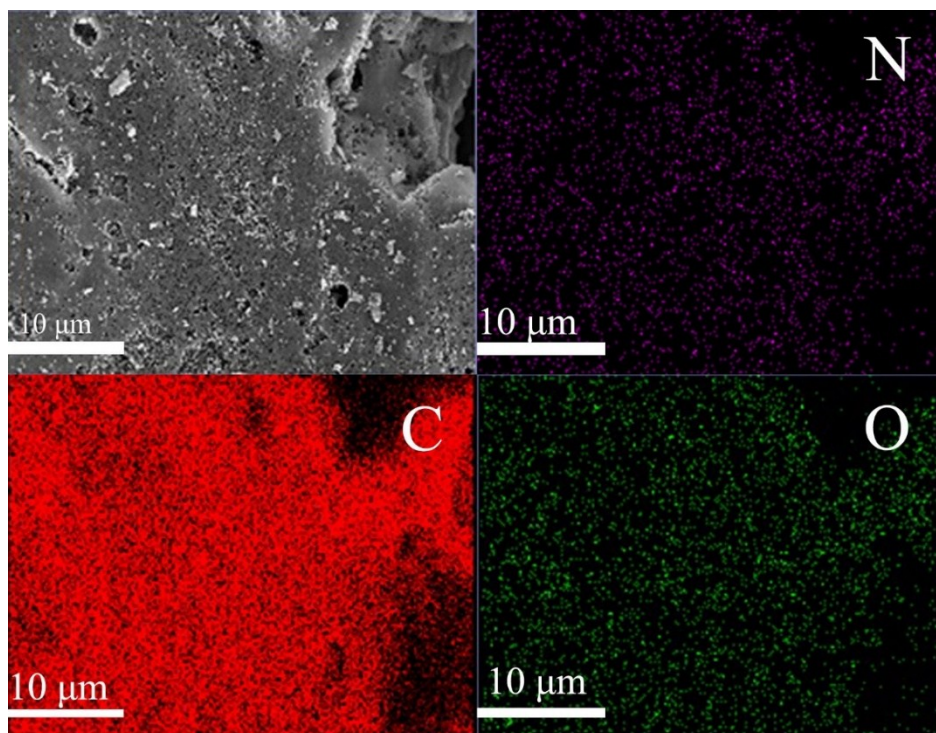


Fig. S8 Elemental mapping images of CBF-N-1.5.

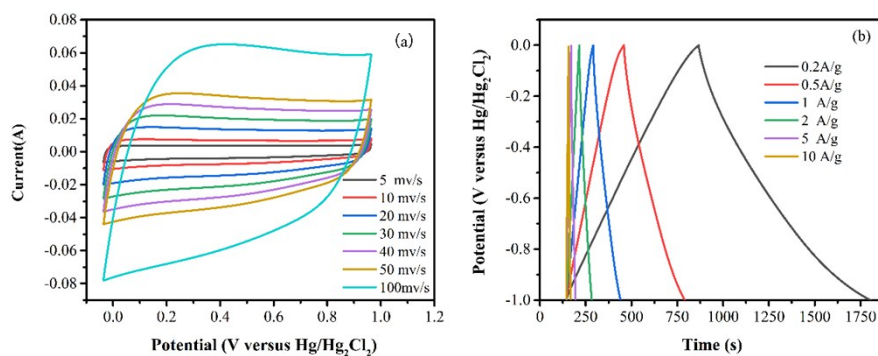


Fig. S9. (a) CV curves of CBF-N-1.5 ( $R = 98.5\%$ ) at different scan rate. (b) GCD curves of CBF-N-1.5 ( $R = 98.5\%$ ) at different current density.

**Reference:**

- [1] Y. Zhao, Z. Liu, W. Chu, S. Li, Z. Zhang, D. Yu, Y. Tian, S. Xie and L. Sun, *Adv Mater*, 2008, 20, 1777-1781.