Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Enhanced Decolorization of Dyes by a High Quality Copolymer Flocculant in Aqueous Solution

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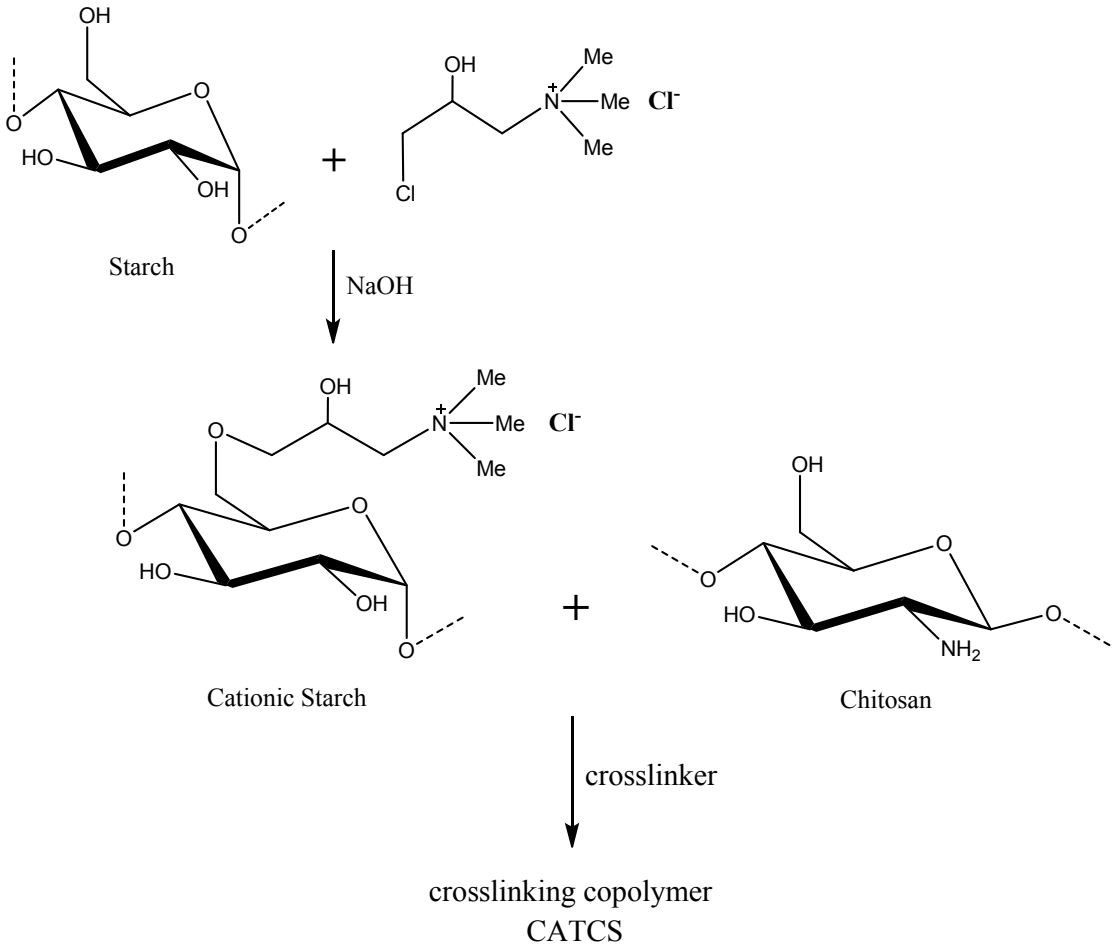
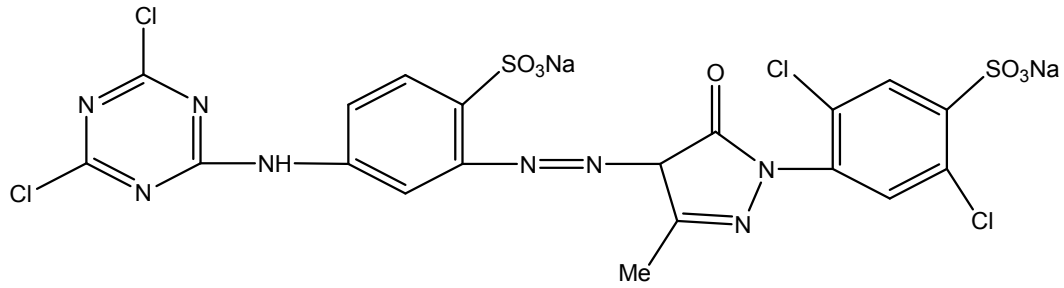
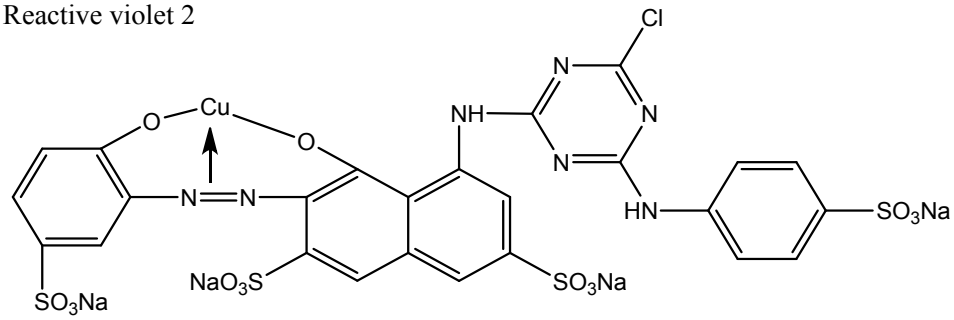


Scheme 1. Schematic representation for the synthesis of CATCS.

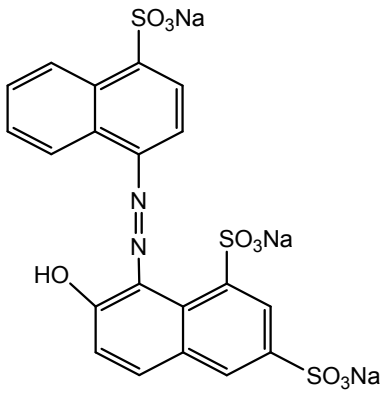
(1) C.I. Reactive Yellow 1



(2) C.I. Reactive violet 2



(3) C.I. Acid Red 18



(4) C.I. Direct Blue 71

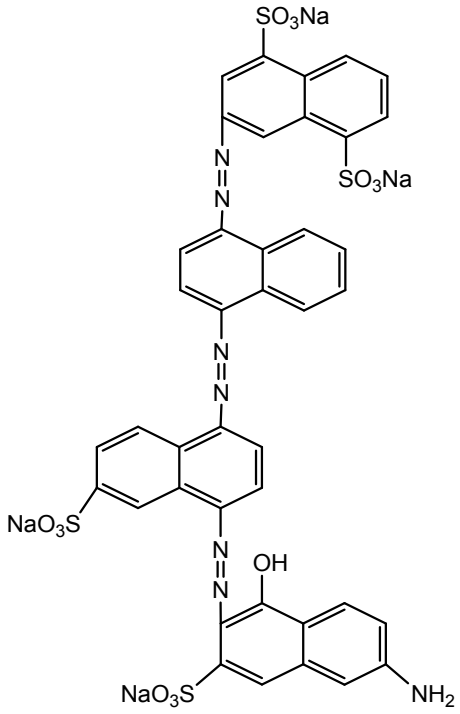


Figure S1. Chemical formula of dyes used in this study (the maximum absorbency wavelength of C.I. Reactive Yellow 1, C.I. Reactive violet 2, C.I. Acid Red 18 and C.I. Direct Blue 71 is 401 nm, 552 nm, 510 nm and 570 nm, respectively).

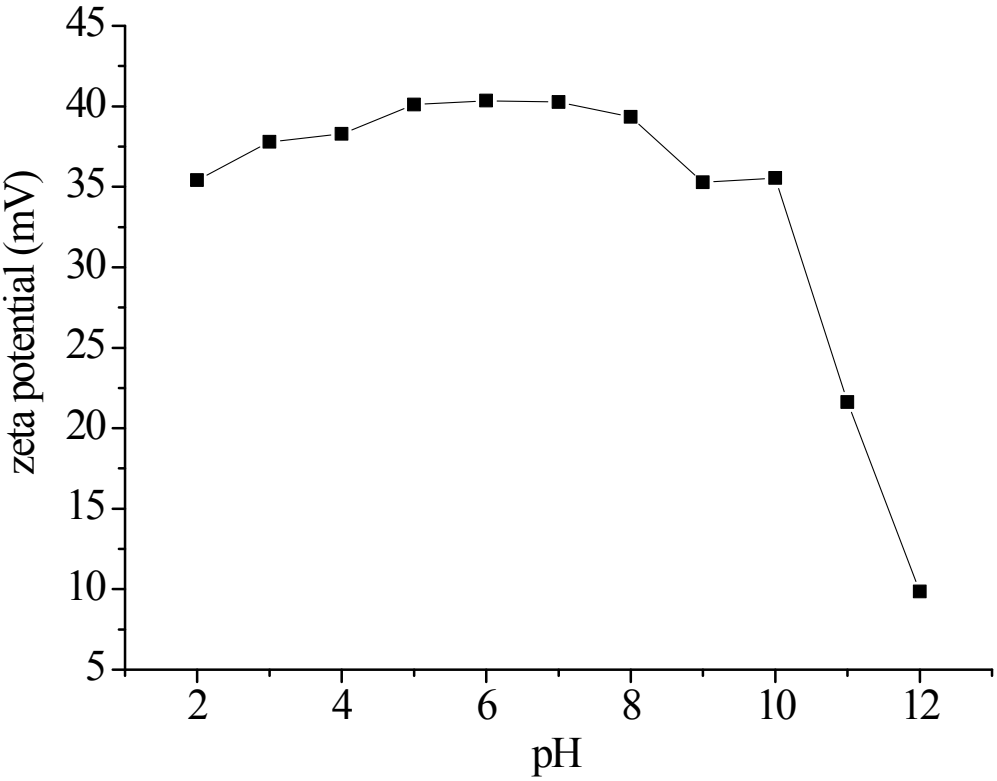


Figure S2. pH effect on zeta potential of CATCS.

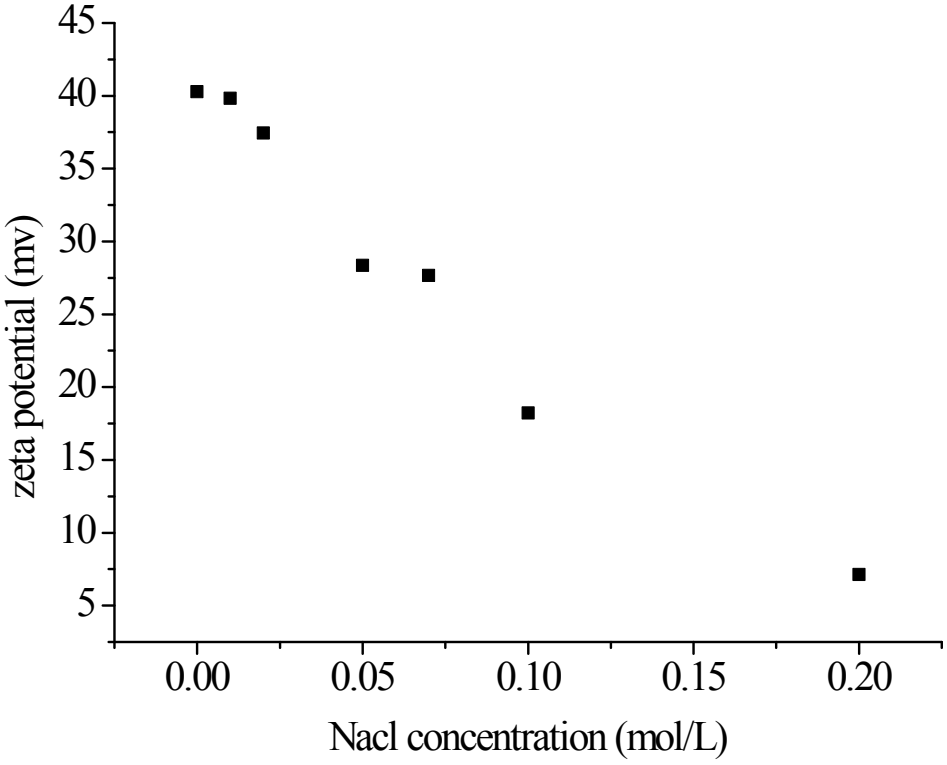


Figure S3. Effect of NaCl on zeta potential of CATCS.

Table S1. Linear fitting parameters of isotherms of C.I. Reactive Yellow 1 by CATCS at various temperatures

T(K)	Tempkin			R–P isotherm			
	K_t (L/mg)	B_1 (L/mg)	R^2	K_R (L/mg)	b_R $(L/mg)^{\alpha}$	α	R^2
293.15	4.042	91.273	0.9057	591.7	3.183	0.7441	0.889
298.15	3.672	103.13	0.9085	651.5	3.267	0.7302	0.890
303.15	6.547	99.349	0.9079	694.6	2.667	0.7834	0.893
308.15	8.632	98.966	0.9266	723.3	2.503	0.8047	0.895
313.15	9.600	105.26	0.8904	750.9	2.341	0.8072	0.893

Table S2. Linear fitting parameters of isotherms of C.I. Reactive violet 2 by CATCS at various temperatures

T(K)	Tempkin			R–P isotherm			
	K_t (L/mg)	B_1 (L/mg)	R^2	K_R (L/mg)	b_R $(L/mg)^{\alpha}$	α	R^2
293.15	1.564	202.95	0.9277	891.54	4.098	0.6118	0.889
298.15	1.387	226.32	0.944	938.23	4.383	0.5781	0.890
308.15	1.924	239.00	0.9128	1083.41	3.929	0.6072	0.893
313.15	1.636	271.75	0.927	1216.7	4.547	0.5634	0.930

Table S3. Linear fitting parameters of isotherms of C.I. Acid Red 18 by CATCS at various temperatures

T(K)	Tempkin			R–P isotherm			
	K_t (L/mg)	B_1 (L/mg)	R^2	K_R (L/mg)	b_R $(L/mg)^{\alpha}$	α	R^2
293.15	1.564	227.52	0.9063	1053.2	3.135	0.7091	0.896
298.15	1.387	295.41	0.9155	1244.9	4.414	0.6394	0.8951
303.15	1.924	395.48	0.902	1450	7.368	0.5331	0.8935
308.15	1.636	289.29	0.9298	1512.5	2.984	0.7469	0.8968
313.15	1.636	297.7	0.9127	1601.2	2.366	0.7571	0.8986

Table S4. Linear fitting parameters of isotherms of C.I. Direct Blue 71 by CATCS at various temperatures

T(K)	Tempkin isotherm			R - P isotherm			
	K_t (L/mg)	B_1 (L/mg)	R^2	K_R (L/mg)	b_R $(L/mg)^{\alpha}$	α	R^2
293.15	8.667742	323.73	0.8738	1825.6	1.415383	0.8922	0.8943
298.15	45.19887	335.26	0.8904	2387.5	2.611696	0.751	0.8973
303.15	166.4683	276.12	0.8749	2420.1	1.264276	1.0591	0.8865
308.15	363.6281	253.59	0.8372	3100.2	2.663391	0.7605	0.8996
313.15	104.9358	296.84	0.8433	3183.7	1.815389	0.7478	0.8994

Table S5. Non-linear fitting parameters of isotherms of C.I. Reactive Yellow 1 by CATCS at various temperatures.

T(K)	Langmuir			Freundlich			D-R isotherm		
	Q_L (mg/g)	K_L (/mg)	R^2	K_F (L/mg)	n	R^2	Q_D (mg/g)	β (mg^2/kJ^2)	R^2
293.15	513	0.252	0.986	179.12	3.93	0.936	449.12	1.08	0.835
298.15	555	0.254	0.990	191.81	3.73	0.933	475.42	0.97	0.899
303.15	579	0.375	0.978	226.82	4.13	0.942	515.83	0.95	0.869
308.15	621	0.358	0.990	248.91	4.29	0.924	540.68	0.49	0.811
313.15	651	0.418	0.989	280.48	4.63	0.890	569.28	0.40	0.782

Table S6. Non-linear fitting parameters of isotherms of C.I. Reactive violet 2 by CATCS at various temperatures.

T(K)	Langmuir			Freundlich			D-R isotherm		
	Q_L (mg/g)	K_L (L/mg)	R^2	K_F (L/mg)	n	R^2	Q_D (mg/g)	β (mg^2/kJ^2)	R^2
293.15	961	0.159	0.946	258.88	3.18	0.823	790.69	2.50	0.990
298.15	1039	0.151	0.961	261.85	2.99	0.835	832.07	2.44	0.980
308.15	1132	0.200	0.924	316.54	3.13	0.808	951.94	1.59	0.990
313.15	1228	0.187	0.907	311.80	2.82	0.830	1001.6	1.51	0.986

Table S7. Non-linear fitting parameters of isotherms of C.I. Acid Red 18 by CATCS at various temperatures.

T(K)	Langmuir			Freundlich			D-R isotherm		
	Q_L (mg/g)	K_L (L/mg)	R^2	K_F (L/mg)	n	R^2	Q_D (mg/g)	β (mg^2/kJ^2)	R^2
293.15	1231	0.094	0.844	306.44	3.25	0.980	1057.3	9.98	0.683
298.15	1508	0.066	0.941	347.3	2.71	0.981	1078.9	3.54	0.628
303.15	1519	0.036	0.930	359.60	2.19	0.982	1349.4	2.86	0.701
308.15	1582	0.117	0.925	410.84	3.28	0.988	1257.2	1.52	0.527
313.15	1610	0.293	0.935	510.54	3.12	0.986	1325.3	0.55	0.685

Table S8. Non-linear fitting parameters of isotherms of C.I. Direct Blue 71 by CATCS at various temperatures.

T(K)	Langmuir			Freundlich			D-R isotherm		
	Q_L (mg/g)	K_L (L/mg)	R^2	K_F (L/mg)	n	R^2	Q_D (mg/g)	β (mg^2/kJ^2)	R^2
293.15	2129	0.094	0.944	764.91	4.18	0.992	1804.5	0.25	0.516
298.15	2672	0.143	0.965	840.96	3.83	0.970	2210.1	2.49	0.683
303.15	2527	0.989	0.828	1150.2	4.54	0.982	2395.8	0.09	0.732
308.15	2632	0.117	0.925	1189.2	4.32	0.998	257.4	0.41	0.664
313.15	2869	0.448	0.863	1277.1	4.24	0.993	2678.3	0.33	0.674

Table S9. Kinetic parameters for C.I. Reactive yellow 1, C.I. Reactive violet 2, C.I. Acid Red 18 and C.I. Direct Blue 71 by CATCS.

dyes	The Elovich Equation			
	T K	α mg/(g·min)	β g/mg	R^2
C.I.Reactive yellow 1	293.15	81198.8	0.0210	0.8675
	298.15	6379.9	0.0229	0.8663
	303.15	34651.4	0.0230	0.8727
	308.15	8601.4	0.0187	0.9127
	313.15	80848.6	0.0209	0.8875
C.I. Reactive violet 2	288.15	103.6	0.0136	0.9049
	293.15	406.5	0.0166	0.9244
	298.15	2313.5	0.0174	0.8365
	308.15	3756.2	0.0166	0.8955
C.I. Acid Red 18	288.15	4342.5	0.0183	0.8417
	293.15	6208.4	0.0139	0.8118
	298.15	5391.2	0.0130	0.7691
	308.15	3433.3	0.0109	0.8596
	318.15	7821.7	0.0115	0.8232
C.I. Direct Blue 71	288.15	353.1	0.0032	0.9045
	298.15	999.1	0.0035	0.8921
	303.15	45144.1	0.0025	0.9029
	308.15	786.7	0.0025	0.9069
	313.15	517.1	0.0023	0.9001