Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

Cobalt–Carbon/Silica Nanocomposite Prepared by Pyrolysis of Cobalt 2,2′-Bipyridine Terephthalate Complex for Remediation of Cationic Dyes

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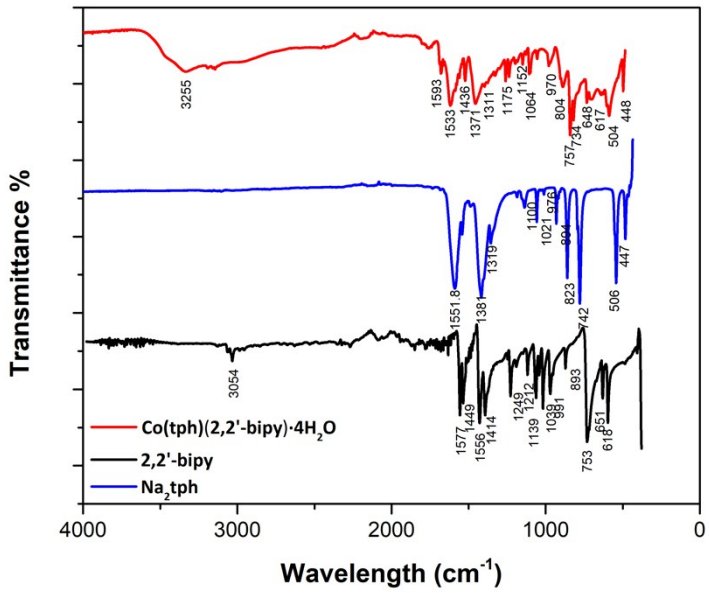

Fig. S1 FTIR spectrum spectra for of Co(tph)(2,2′′-bipy)·.4H_2O (1), 2,2′-bipy, and Na2tph.

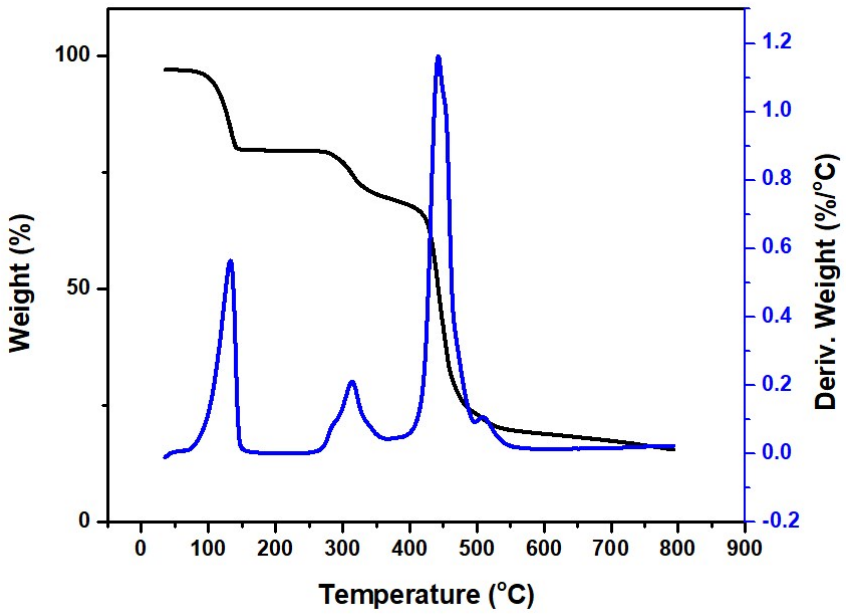

Fig. S2 TGA and DSC curves of Co(tph)(2,2′-bipy).4H_2O **(1)**.

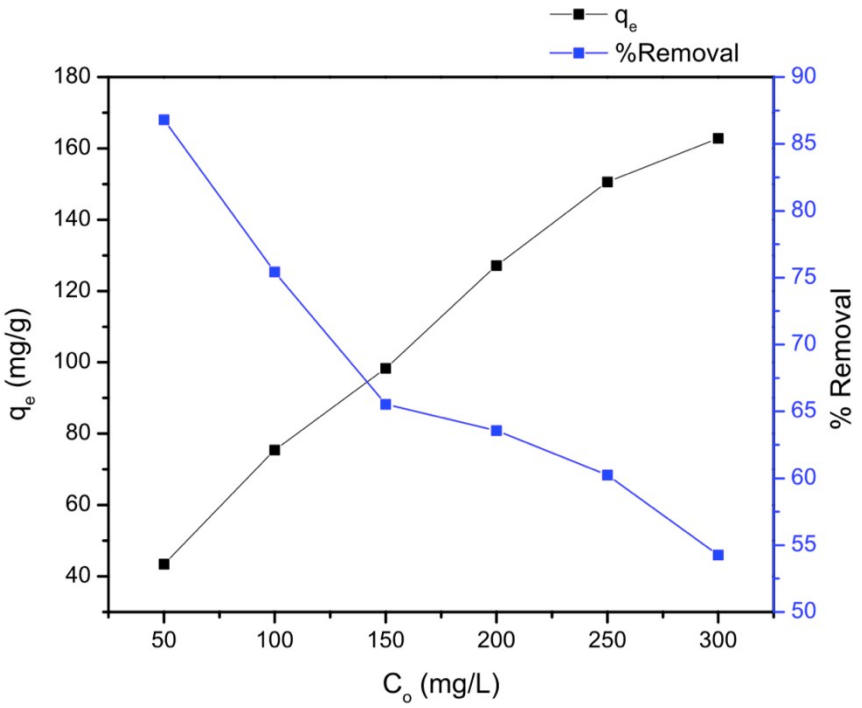

Fig. S3 Effect of the initial dye concentration on the amount of CV dye adsorbed to CoC@SiO_2-850 (**3**) from aqueous solution at 298 K. Adsorbent dosage 1 mg/L, initial dye concentration 50, 100, 150, 200, 250 and 300 mg/L, agitation speed 120 rpm, and contact time 24 h.

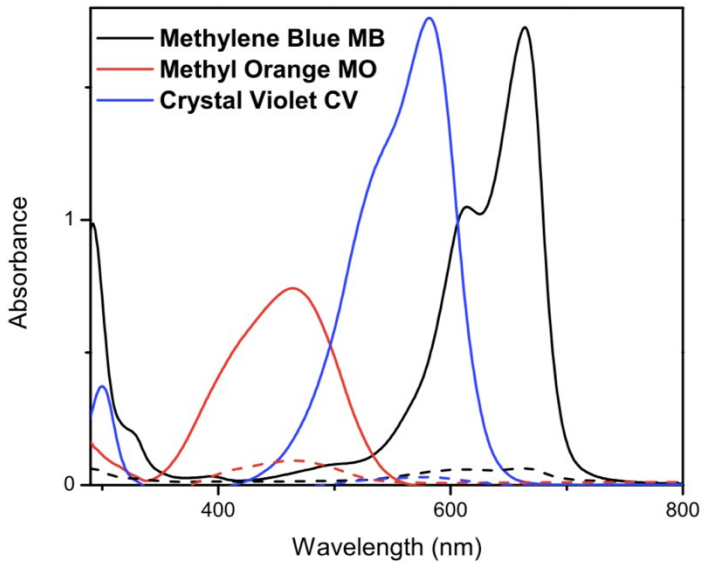

Fig. S4 Absorbance of MB, MO, and CV before and after adsorption to CoC@SiO_2-850 (**3**). Adsorbent dosage 4 mg/L, initial dye concentration 100 mg/L, temperature 298 K, agitation speed 120 rpm, and contact time 24 h.

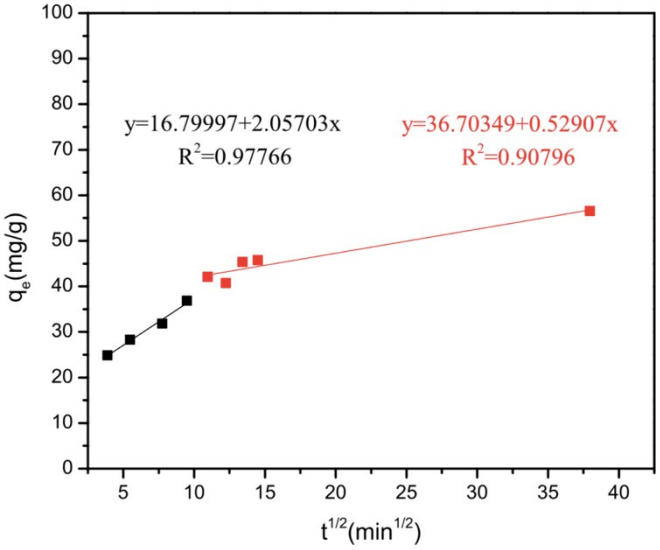

Fig. S5 . Intra-particle diffusion plot of q_e versus $t^{1/2}$ for adsorption of CV to **3**.

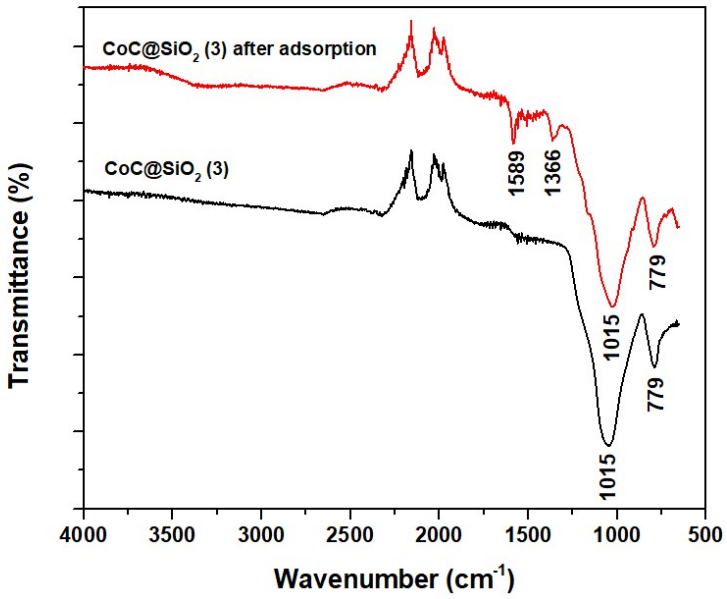

Fig. S6 FTIR spectra of **3** before and after adsorption of CV

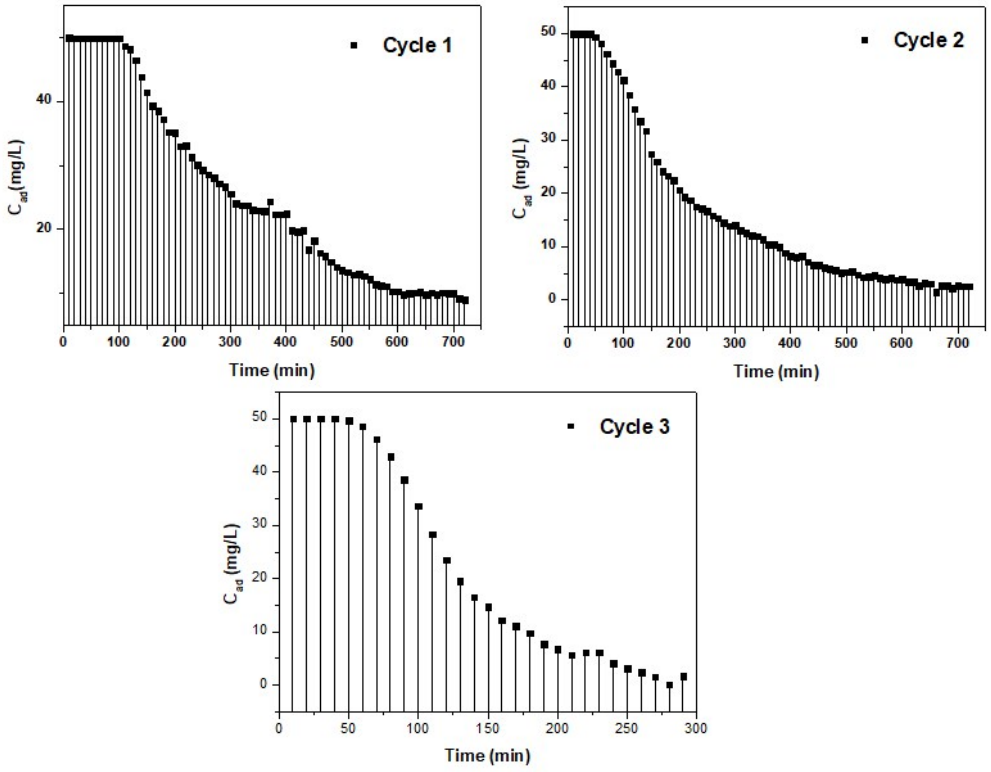

Fig. S7 . Plot of C_{ad} versus time for the three cycles of adsorption of CV to **3**.

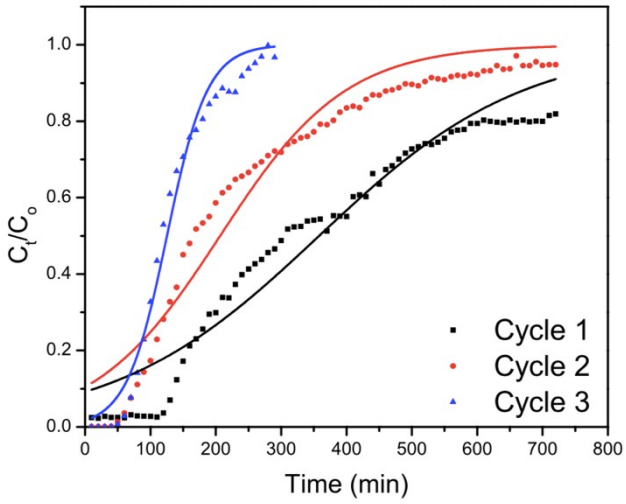

Fig. S8 Thomas non-linear fit of adsorption of CV to the column packed with **3**.

Table S1. Crystal data and structure refinement of Co(μ-tph)(2,2'-bipy) **(2)**.

Acronym	$[Co(\mu\text{-tph})(2,2'\ bipy)]_n$
Temperature	100K
Empirical formula	$C_{18}H_{12}CoN_2O_4$
Formula weight	379.23
Crystal system	Monoclinic
Space group	$P2_{1/c}$
a/Å	7.3164(10)
b/Å	23.412(3)
c/Å	12.3254(17)
α/°	90
β/°	94.770(2)
γ/°	90
Volume/Å^3	2103.9(5)
Z	4
Density / (g cm^{-3})	1.197
μ / mm^{-1}	0.835
F000	772.0
h,k,lmax	9,31,16
Absorption correction	Multi-scan
No. of measured reflections	16361
No. of reflections used	5203
wR2(reflections)	0.0982(5203)
GooF	1.046

Table S2. FTIR assignment of Co(tph)(2,2'- bipy).4H_2O **(1)**.

Na_2tph[1,2]	**2,2'-bipy**[3]	**(1)**	**assignment**
-	-	3255 m	O-H stretching vibration of water
3054 w	3054w	3054 w	aromatic (=C-H) stretching vibration
-	1577 s 1556 s	1593 w	aromatic (C=C, C=N) ring stretching
-	1449 s 1414 s 1063m	-	ring stretching + C-H in-plane bending
-	991 m	-	C-H out-of-plane bending + ring breathing
976 w 894 m 823 s	893 m 753 s	804 m 757 s 734 s	C-H out of plane bending
-	651 m 618 s	648 m 617 m	ring bending
1100 w 1021 m	-	-	C-H in-plane bending
1551 s	-	1533 m	COO^- asymmetric vibration
1381 s	-	1371 m	COO^- symmetric vibration
1319 m	-	1311 vw	Ring stretching
742 s 506 s	-	734 m 504 m	COO^- in-plane bending (scissoring) COO^- in-plane bending (rocking)
447 m	-	448 vw	C-C-O in-plane bending

Table S3. Surface areas, cumulative pore volumes and pore widths of CoC@SiO_2-850 (**3**) and (**5**) from N_2 sorption isotherms at 77 K.

Pyrolytic product	surface area (m^2/g)				cumulative pore volume (cm^3/g)		pore width (Å)	
	single point	BET	BJH $_{Ads}$	BJH $_{Des}$	BJH $_{Ads}$	BJH $_{Des}$	BJH $_{Ads}$	BJH $_{Des}$
(3)	at P/Po 0.20 45.0360	45.837	28.6760	55.4173	0.07055	0.08104	98.422	58.499
(5)	at P/Po 0.30 427.5094	335.39	469.596	508.985	0.58422	0.58422	49.764	49.764

References

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2 H. T. Varghese, C. Y. Panicker, D. Philip, K. Sreevalsan and V. Anithakumary, *Spectrochim. Acta - Part A Mol. Biomol. Spectrosc.*, 2007, **68**, 817–822.
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