Electronic Supplementary Information

CuO nanoleaves and β-cyclodextrin functionalized reduced graphene oxide: A highly selective and sensitive electrochemical sensor for the simultaneous detection of 2-chlorophenol and 2, 4-dichlorophenol

Umme Solaem Akond[a], Abhinandan Mahanta[a] and Sk. Jasimuddin[a]*

Department of Chemistry, Assam University, Silchar, Assam-788011, India

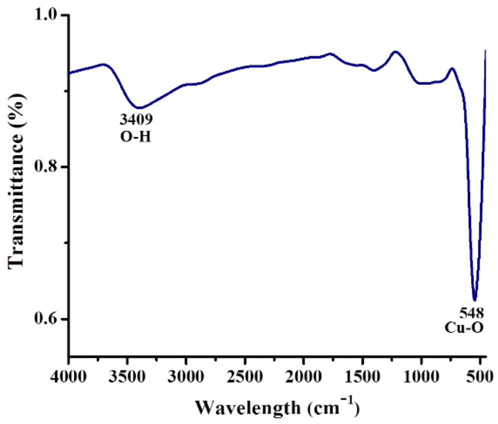


Fig. S1 FTIR spectra of CuO nanoleaves

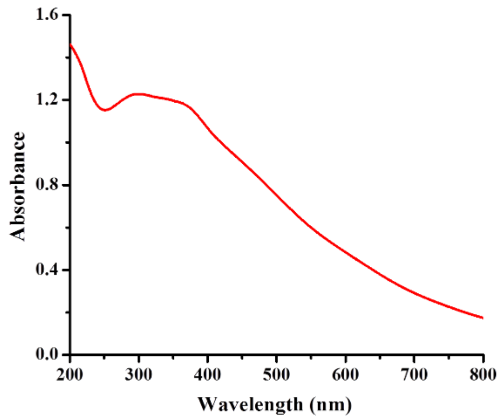


Fig. S2 UV-visible spectra of CuO nanoleaves in aqueous solution

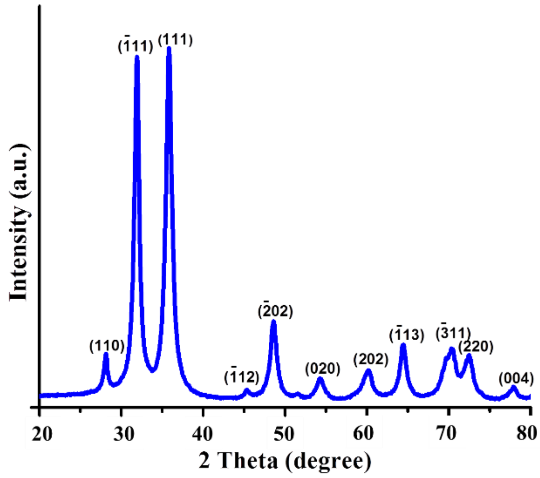


Fig. S3 X-ray diffraction pattern of CuO NLs.

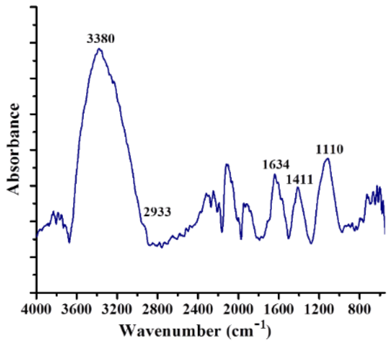


Fig. S4a ATR-FTIR of rGO-GCE

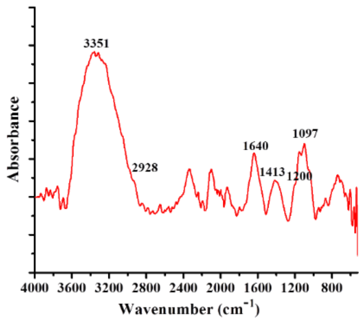


Fig. S4b ATR-FTIR of β-CD-rGO-GCE

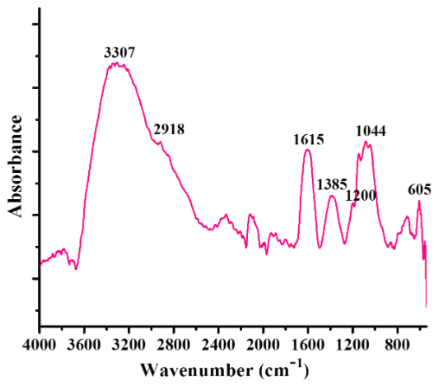


Fig. S4c ATR-FTIR of CuO-β-CD-rGO-GCE

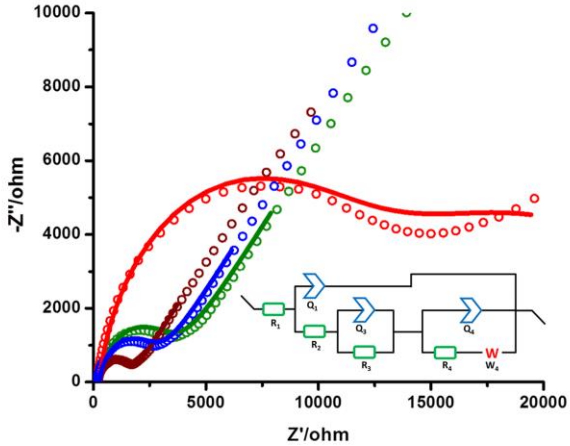


Fig. S5 Overlaid Nyquist plots (-Z''*versus* Z', E_{ac}= 10 mV, frequency range: 0.01-100000 Hz) of 0.5 mM $K_4[Fe(CN)_6]$ in 0.1 M PBS (pH 7.0) at GCE (green curve), rGO-GCE (brown curve), β-CD-rGO-GCE (red curve) and CuO NLs-β-CD-rGO-GCE (blue curve). Data points are experimental while the solid lines are the fitted lines (Inset: Randles equivalent circuit used to fit the EIS data)

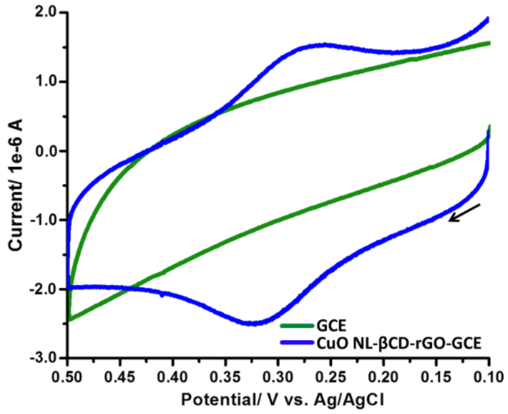
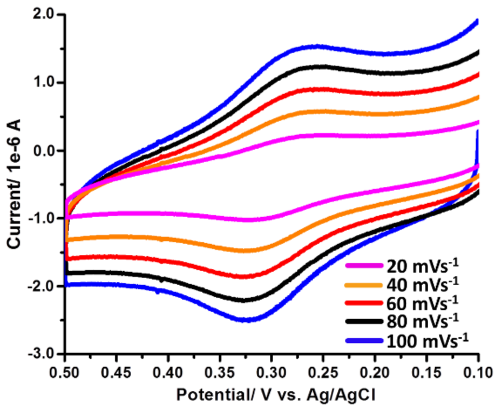
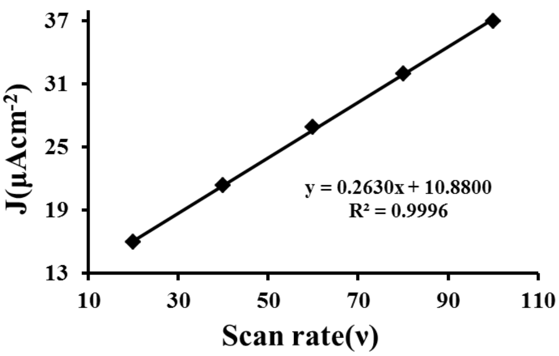


Fig. S6 Cyclic voltammograms obtained at bare and CuO NLs-β-CD-rGO modified GCE in 0.1 m PBS (pH 7.0).



(a)



(b)

Fig . S7 Overlaid cyclic voltammograms obtained with increasing scan rate at CuO NLs-β-CD-rGO-GCE in 0.1 m PBS (pH 7.0)(a); A plot of current density (J) *versus* scan rate (ν) (b).

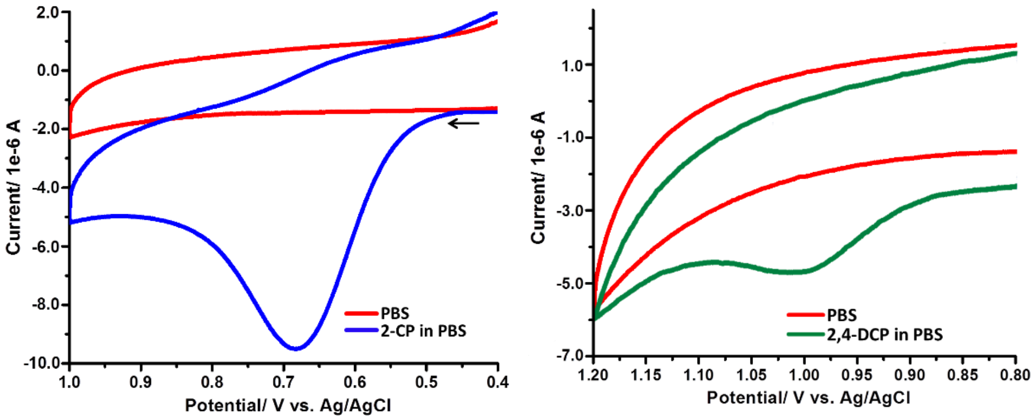


Fig. S8 Overlaid CVs for 0.1 M PBS (red curve) and 10 μM 2-CP in 0.1 M PBS (pH 6.0) (blue curve) (a); Overlaid CVs for 0.1 M PBS (red curve) and 10 μM 2,4-DCP in 0.1 M PBS (pH 6.0) (green curve) (b).

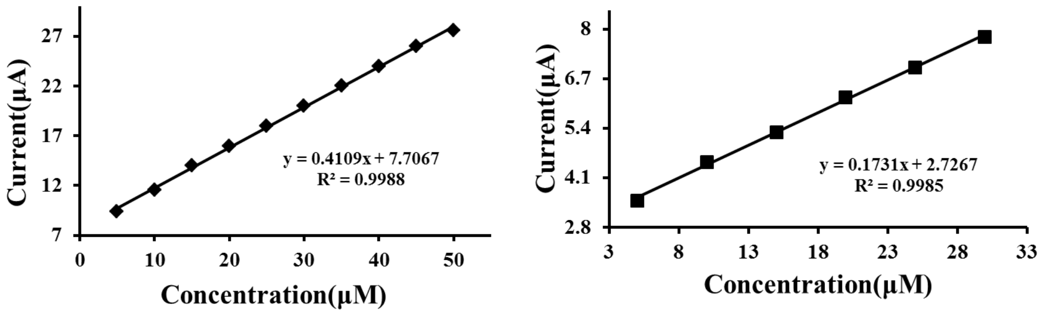
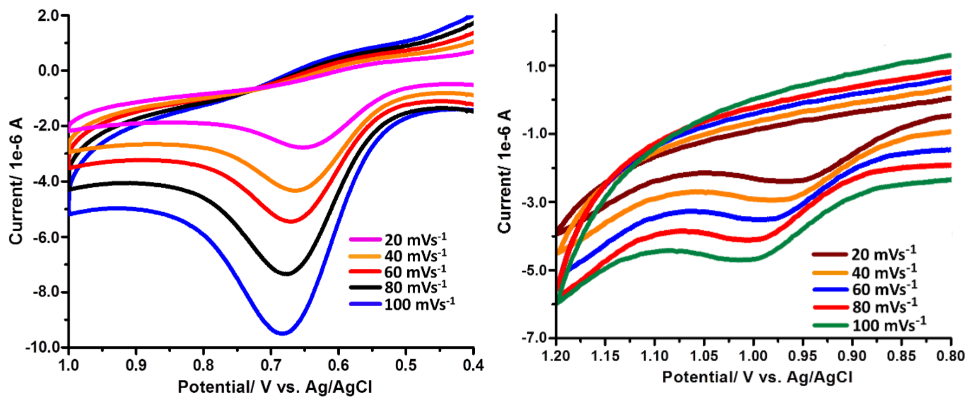
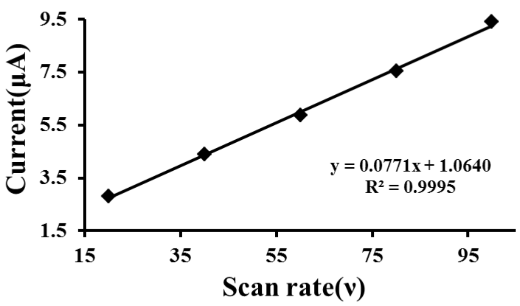


Fig. S9 A plot of current as a function of concentration of 2-CP with linear trend line (R^2> 0.99) (a); A plot of current as a function of concentration of 2,4-DCP with linear trend line (R^2> 0.99)(b).

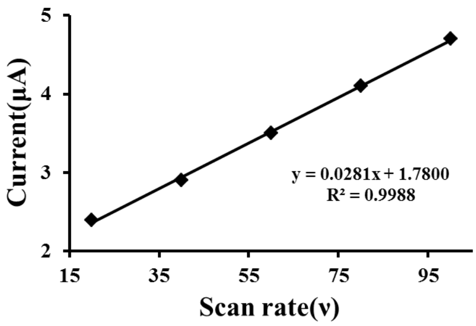


(a) (b)

Fig. S10 CVs of 10 μM 2-CP (a) and 10 μM 2,4-DCP (b) in 0.1 M PBS (pH 6.0) at different scan rate (20-100 mVs^{-1}) using CuO NLs-β-CD-rGO-GCE.



(a)



(b)

Fig. S11 Plot of oxidation peak current of 10 µM 2-CP (a) and 10 µM 2,4-DCP (b)*versus* scan rate.

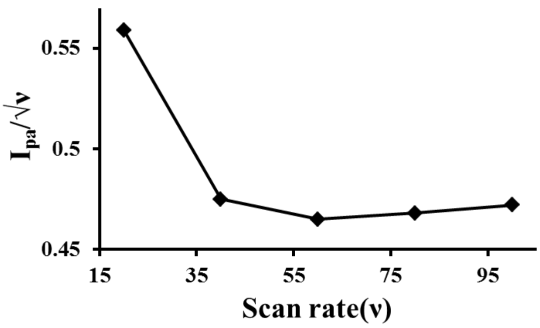
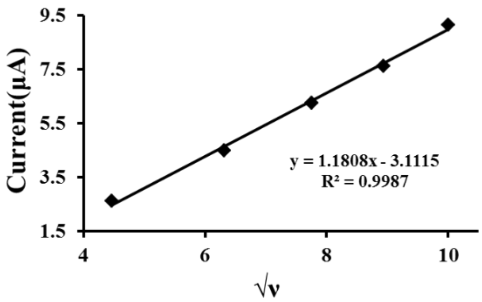
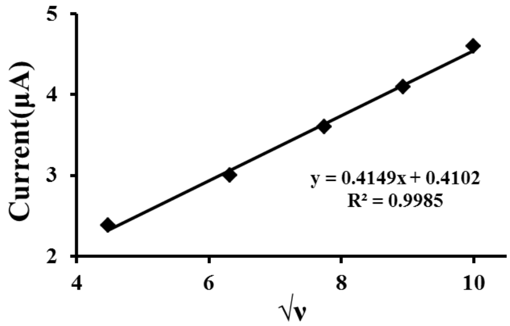


Fig. S12 A plot of scan rate –normalized current *versus* scan rate

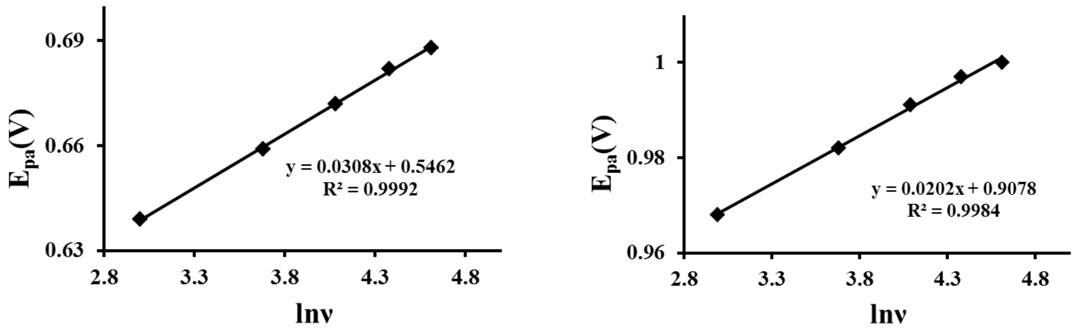


(a)



(b)

Fig. S13 Plot of oxidation peak current of 10 µM 2-CP (a) and 10 µM 2,4-DCP (b) *versus* square root of scan rate.



(a) (b)

Fig. S14 Plot of E_{pa} *versus* lnν for 2-CP (a) and 2,4-DCP (b)

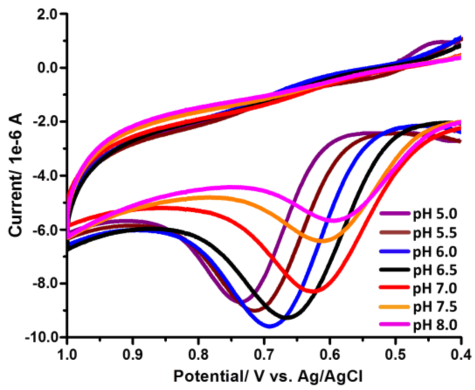


Fig. S15 Overlaid CVs of 10 μM 2-CP at different pH using CuO NLs-β-CD-rGO-GCE.

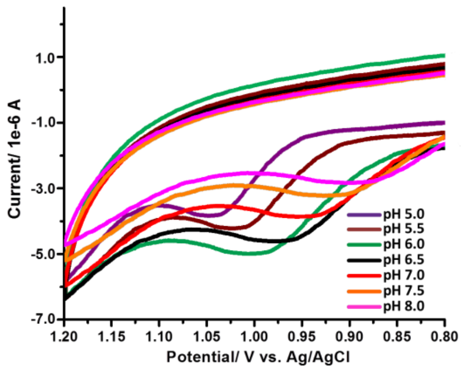
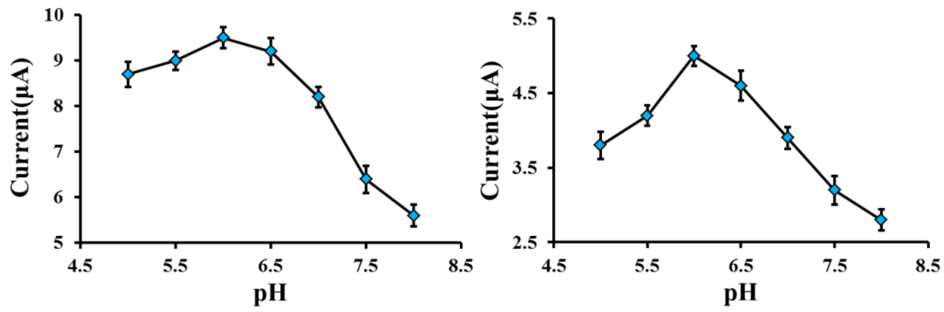
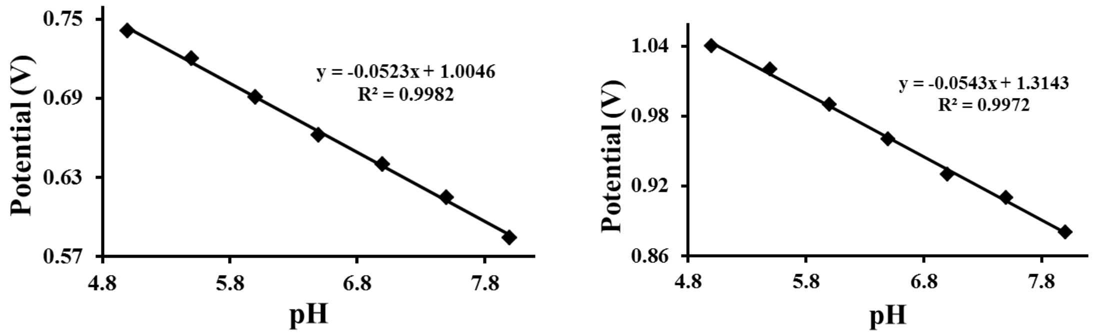


Fig. S16 Overlaid CVs of 10 μM 2,4-DCP at different pH using CuO NLs-β-CD-rGO-GCE.



(a) (b)

Fig. S17 Plot of oxidation peak current of 10 μM 2-CP (a) and 2,4-DCP (b) *versus* pH at CuO NLs-β-CD-rGO-GCE in 0.1 M PBS.



(a) (b)

Fig. S18 Plot of oxidation peak potential of 10 μM 2-CP *versus* pH (a); Plot of oxidation peak potential of 10 μM 2,4-DCP *versus* pH (b).

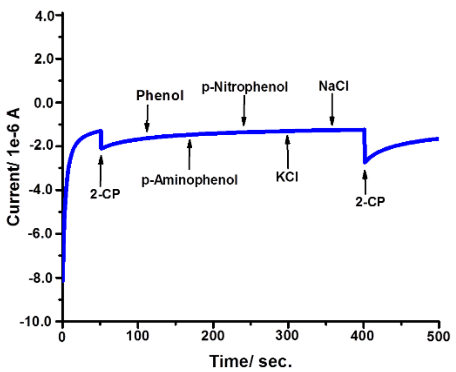


Fig. S19 Amperometric response at CuO NLs-β-CD-rGO-GCE with an applied potential of 0.68 V on subsequent addition of 10 μM 2-CP, 50 μM phenol, 50 μM p-aminophenol, 50 μM p-nitrophenol, 50 μM KCl, 50 μM NaCl and 10 μM 2-CP under stirring condition in 0.1 M PBS (pH 6.0).

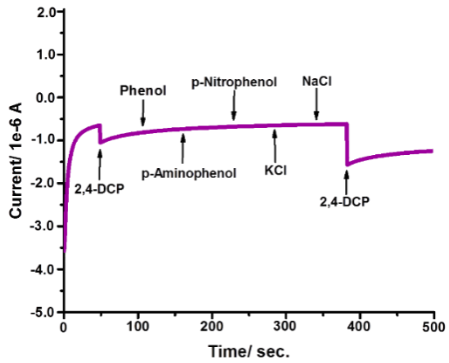


Fig. S20 Amperometric response at CuO NLs-β-CD-rGO-GCE with an applied potential of 1.0 V on subsequent addition of 10 μM 2,4-DCP, 50 μM phenol, 50 μM p-aminophenol, 50 μM p-nitrophenol, 50 μM KCl, 50 μM NaCl and 10 μM 2,4-DCP under stirring condition in 0.1 M PBS (pH 6.0).

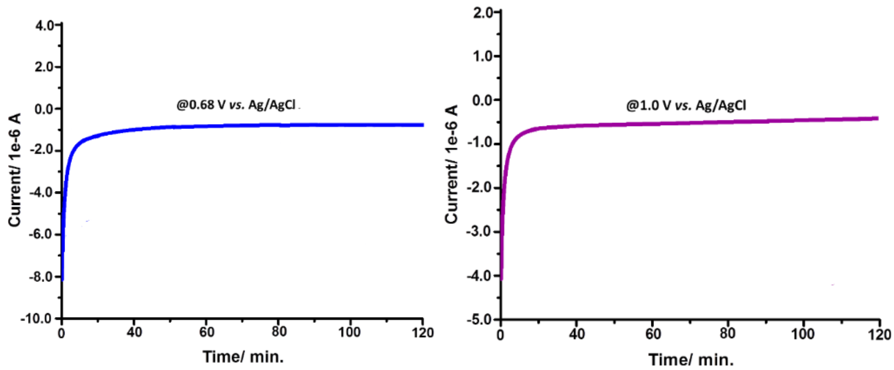


Fig. S21 Chronoamperogram obtained by using CuO NLs-β-CD-rGO-GCE at an applied potential 0.68 V and 1.0 V in the presence of 10 μM 2-CP (a) and 10 μM 2,4-DCP (b), respectively in 0.1 m PBS (pH 6.0).

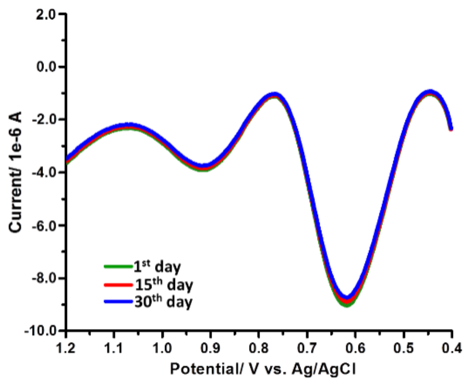


Fig. S22 Overlaid DPVs of a mixed solution of 5 μM 2-CP and 5 μM 2,4-DCP in 0.1 M PBS (pH 6.0) obtained by using the CuO NLs-β-CD-rGO-GCE (DPVs were taken fifteen days interval and the electrode was kept by covering a Teflon cap when not in use).

Table S1 Simultaneously analysis of 2-CP and 2,4-DCP in spiked water sample

River water [a]	Spiked (μM)	Found(μM)	RSD (%) (n = 5)	Recovery (%)
2-CP	0	Not detected	–	–
	1.5	1.48	1.01	98.67
	2	2.03	1.03	101.50
2,4-DCP	0	Not detected	–	–
	1.5	1.43	0.99	95
	2	1.96	1.10	98

[a] Obtained from The Brahmaputra River