Supplementary Information

Cerium doped nickel-oxide nanostructures for riboflavin biosensing and antibacterial applications

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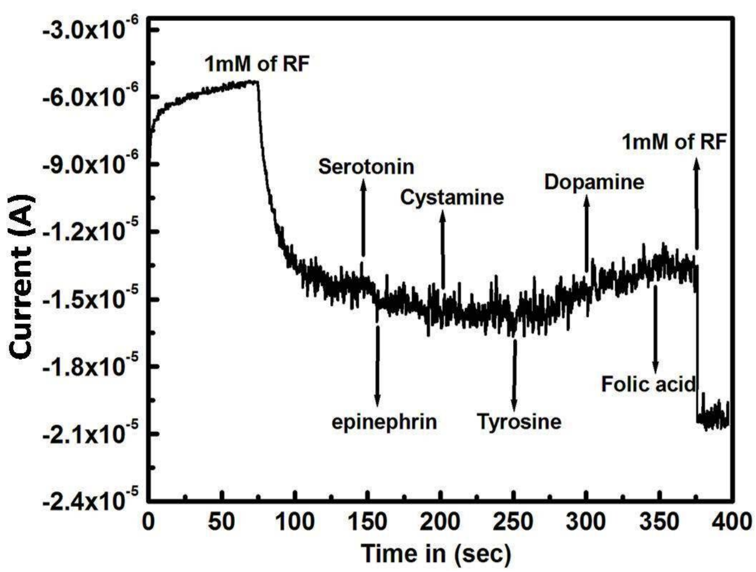

Figure S1. Amperometric i–t curve for the addition of 1 mM of RF and 10 mM (10 fold) serotonin, epinephrine, cystamine, dopamine, tyrosine and final addition of 1 mM of RF at 5 wt.% Ce-NiO modified electrode in PBS (pH 7.2). Its applied potential -0.50 V.

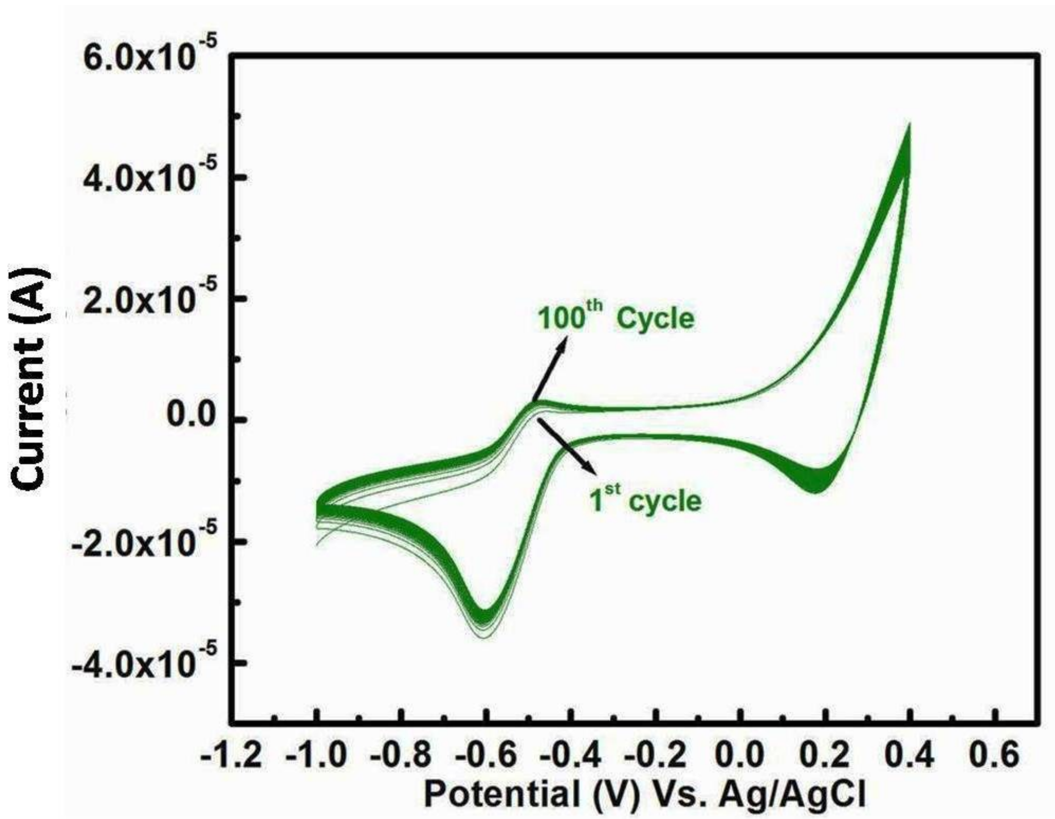

Figure S2.100 cycles of CVs of the modified GCE in presence of 1.0 mM RF 0.1 M KCl at a scan rate of 100 mV s^{-1}

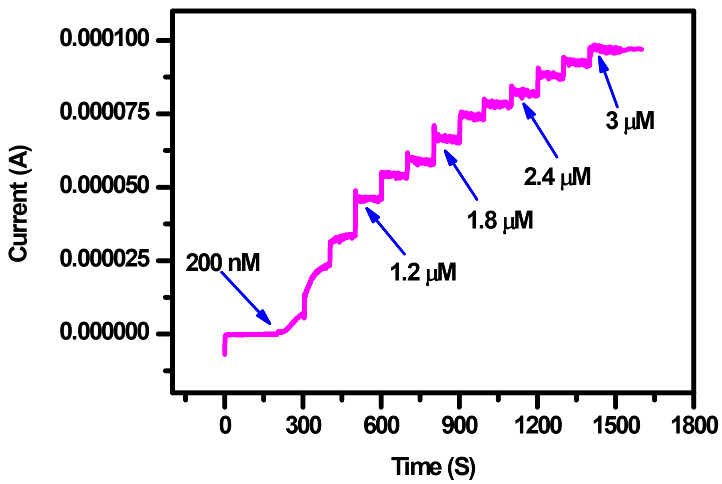

Figure S3. Amperometric responses at 5wt. % of Ce doped NiO modified GCE upon periodical addition of RF into 0.1M PBS at -0.5V

Table S1 Crystallite Size for different percentage of Ce doping with NiO Samples

S.No	Sample	Size in nm
1	Pure NiO	90
2	1 wt.% of Ce doped NiO	85
3	3 wt.% of Ce doped NiO	74
4	5 wt.% of Ce doped NiO	72
5	7 wt.% of Ce doped NiO	57
6	9 wt.% of Ce doped NiO	41

Table S2 Zone of inhibition (ZI), MIC and MBC values of sample a-f against various bacterial strains

Bacteria	Sample a			Sample b			Sample c			Sample d			Sample e			Sample f		
	ZI (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)	**ZI** (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)	**ZI** (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)	**ZI** (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)	**ZI** (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)	**ZI** (mm)	**MIC** (µg/mL)	**MBC** (µg/mL)
K. pneumoniae	-	>100	>100	-	>100	>100	9	70	80	11	30	40	10	30	40	-	>100	>100
S. typhi	13	30	30	9	80	90	15	30	40	17	20	30	15	20	30	12	40	50
P. aeruginosa	12	50	60	10	60	70	11	40	50	14	30	40	11	50	60	10	60	70
B. cereus	12	50	60	10	60	60	12	50	50	14	30	40	11	30	40	10	40	40
B. subtilis	17	20	30	15	20	20	20	10	20	22	10	10	17	10	20	15	20	30
S. aureus	17	20	20	14	20	30	15	20	20	18	10	20	16	20	30	13	30	30

* The values are mean of triplicate experiments

Table S3 Comparison of the efficiency of reported electrochemical methods in the determination of RF

Electrode	limit of detection	linear range	reference
(1) P3MT/GCE	5.0×10^{-8} mol L^{-1}	$1.0 \times 10^{-7} – 2.0 \times 10^{-4}$ mol L^{-1}	[1]
(2) Aza / PCPE	0.2 ng cm^{-1}	0.5 ng cm^{-3} to 70µg cm^{-3}	[2]
(3) DNA/CNT	0.2 ng L^{-1}	5.31×10^{-13} mol L^{-1} -	[3]
(4) C -18/AuE	2.3µg mL^{-1}	-	[4]
(5) CILE	0.1 nM	0.8 – 110nM	[5]
(6) Ag amalgam film	0.009	0.05 - 3	[6]
(7) AgSAEs	8.2×10^{-10} mol L^{-1}(m – AgSAE) and 1.3×10^{-9} mol L^{-1}(p-AgSAE)	-	[7]
(8) $WO_3 – TiO_2$ / ITO	1.87×10^{-7} M	3.23×10^{-7} to4.0×10^{-5} M	[8]
(9) Ds-DNA/ PCE	0.34 µg mL^{-1}	0.5 – 70 µg mL^{-1}	[9]
(10) Cr- SnO2 / GCE	107 nM	0.2×10^{-6} to 1.0×10^{-4} M	[10]
(11) α - Fe_2O_3/MWCNT/AuNP	6nM	50×10^{-9} to 600×10^{-6}	[11]

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Table S4 Determination of the riboflavin content in commercial pharmaceutical products and milk powder by SWV on the 5 wt. % of Ce-doped NiO modified electrode.

Sample	Reported content (mg)	Content found (mg)	Recovery %
multivitamin tablet	1.6	1.45	90.6
multivatimin capsule	2	1.8	90
Milk powder	0.78	0.70	89.7