Electronic Supplementary Material (ESI) for RSC Advances.

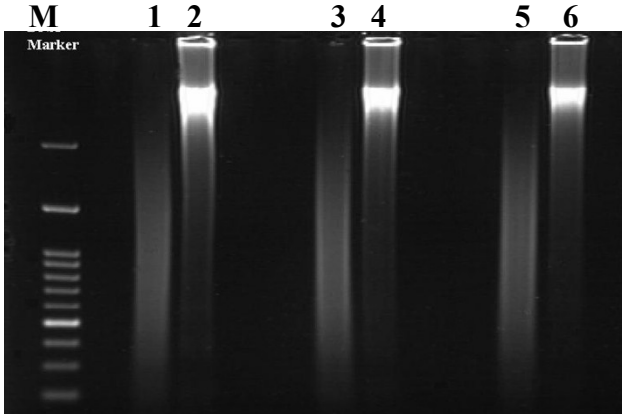

Fig. S1: Images of agarose gel electrophoresis of ssDNA and dsDNA. Lane M: DNA marker; concentrations of ssDNA: 1.0 (Lane1), 0.5 (Lane3) and 0.25 (Lane 5) mg/ml. Concentrations of dsDNA: 1.0 (Lane 2), 0.5 (Lane4) and 0.25 (Lane 6) mg/ml.

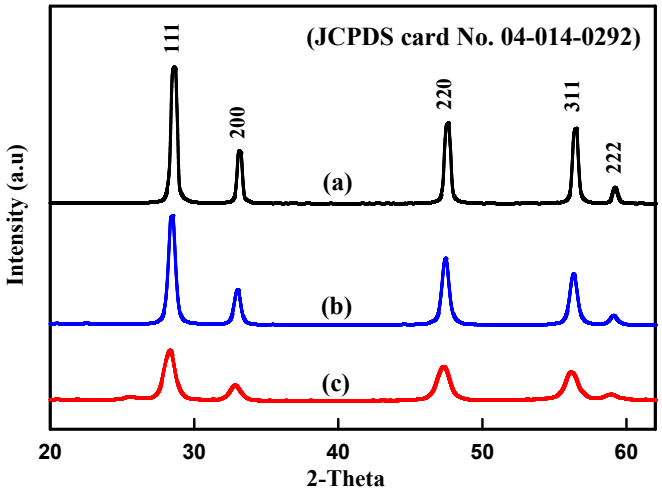

Fig.S2: XRD patterns of (a) undoped CeO_2, (b) 5 wt% and (c) 10 wt% In doped CeO_2 nanoparticles.

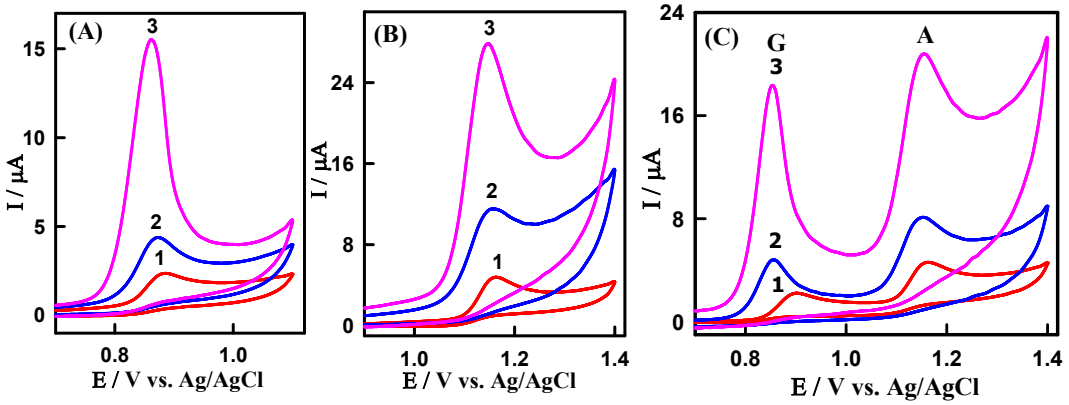

Fig.S3: CVs of 27.24 µM G (A) and 56.6 µM A (B) in PBS of pH4.0 obtained at (1) bare GCPE, (2) CeO_2NPs/GCPE and (3) In–CeO_2NPs/GCPE

(C) CVs at bare GCPE (1) CeO_2NPs/GCPE (2) and In–CeO_2NPs/GCPE (3) in PBS (pH 4.0) containing a mixture of 36.40 µM G and 54.50 µM A; scan rate, 100mV/s; accumulation time, 30s.

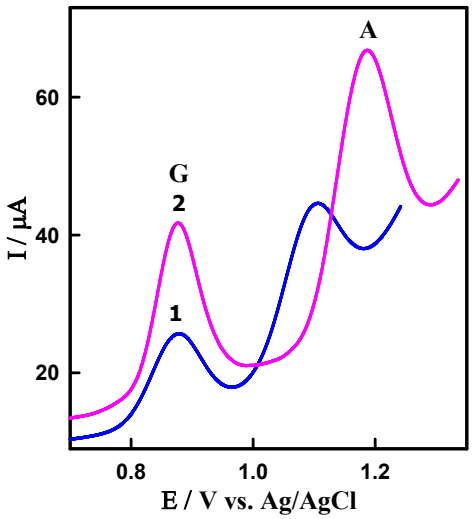

Fig.S4: SW voltammograms for a mixture 31.6 μM G and 55.4 μM A at pH 4.0 PBS using (1) nano-B–CeO_2/GCPE (2) nano-In–CeO_2/GCPE

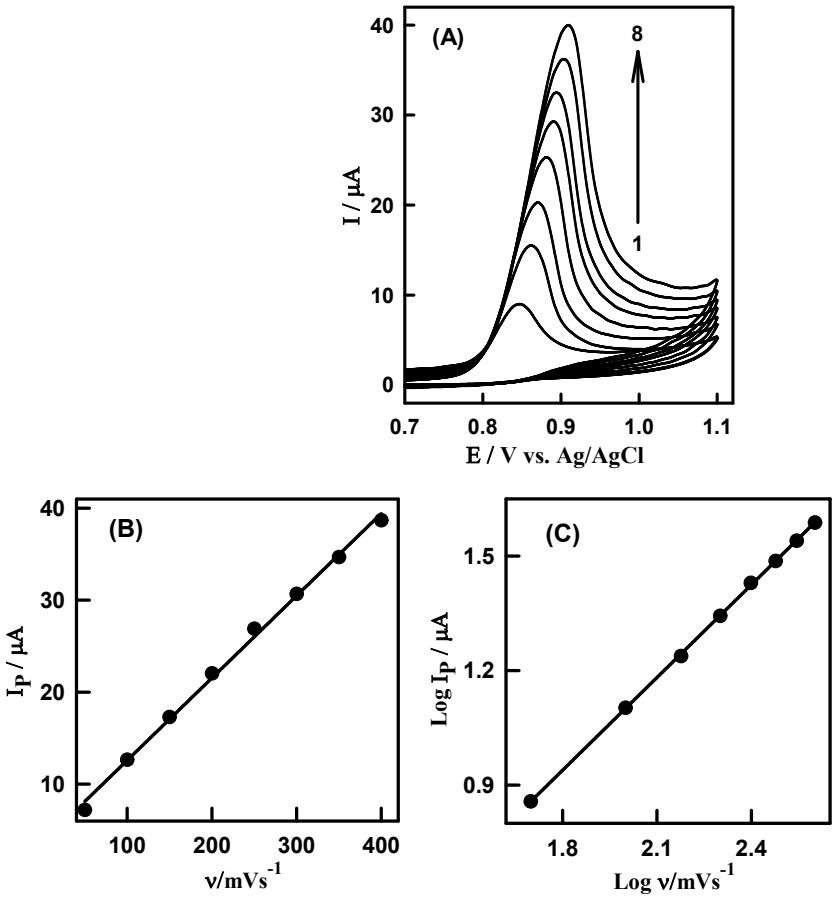

Fig.S5: (A) CVs of 27.24 µM G on the surface of In–CeO_2NPs/GCPE at various scan rates in PBS (pH4.0); (1) 50, (2) 100, (3)150, (4)200, (5) 250, (6) 300, (7) 350 and (8) 400 mVs^{-1}. (B) Plot of peak current (I_{pa}) versus scan rate (ν). (C) Plot of log of peak current (log I_{pa}) versus log of scan rate (log ν).

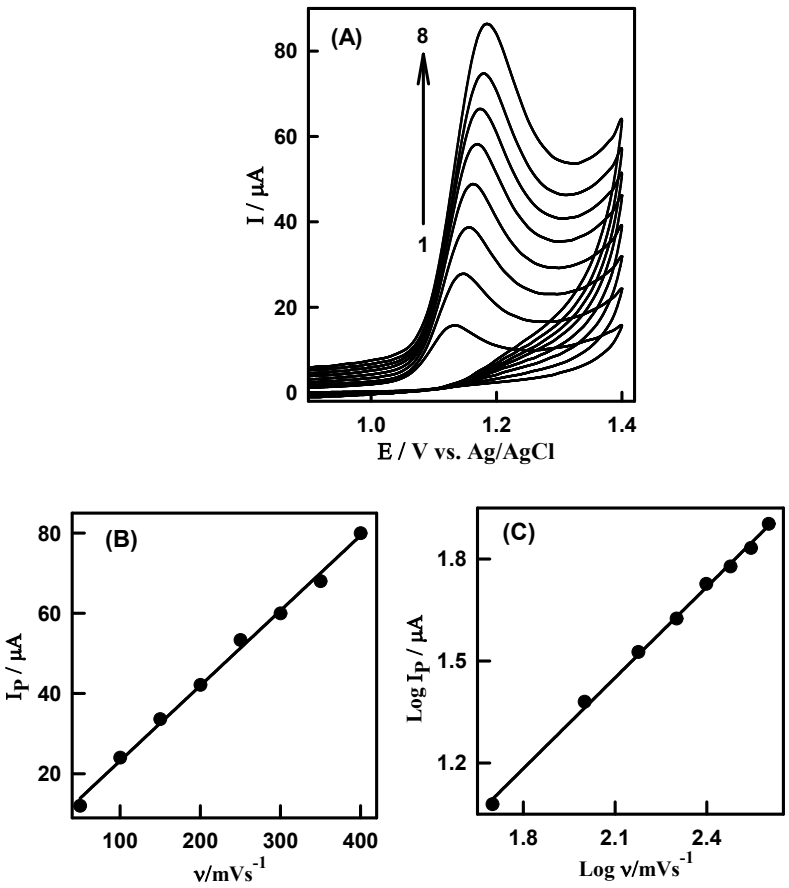

Fig.S6: CVs of 56.60 μM A on the surface of In–CeO_2NPs/GCPE at various scan rates in PBS (pH4.0); (1) 50, (2) 100, (3)150, (4)200, (5) 250, (6) 300, (7) 350 and (8) 400 mVs^{-1}. (B) Plot of peak current (I_{pa}) versus scan rate (ν). (C) Plot of log of peak current (log I_{pa}) versus log of scan rate (log ν).

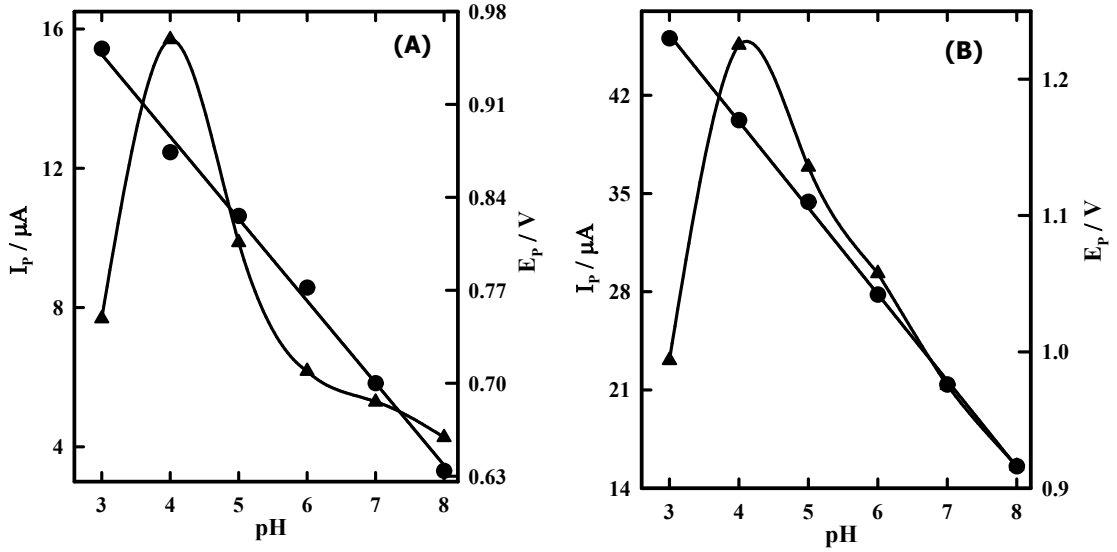

Fig.S7: Effect of pH on E_P(●) and I_P(▲) for G (A) and A (B)

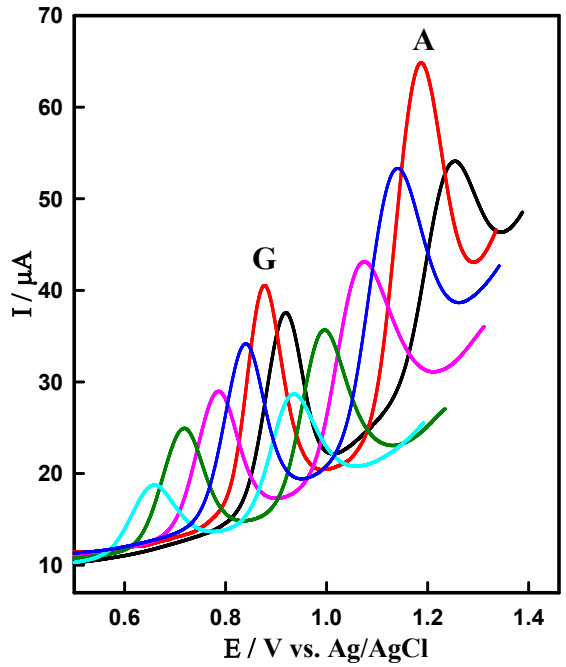

Fig.S8: SW voltammograms for a mixture 31.6 µM G and 55.4 µM A on the surface of In–CeO_2NPs/GCPE at different pH values (PBS): (1) pH 3, (2) pH 4, (3) pH 5, (4) pH6; (5) pH7 and (6) pH8; accumulation potential, +0.1 V; accumulation time, 60s; scan increment, 6 mV; frequency, 100 Hz and pulse height, 30 mV.

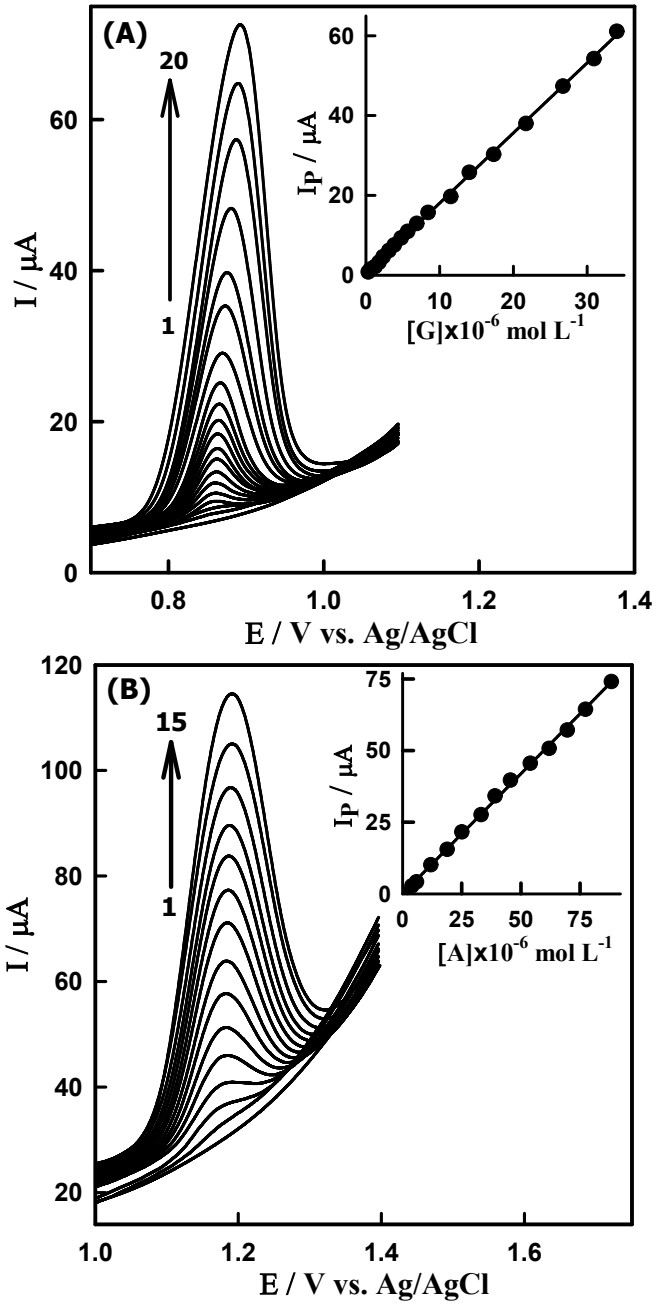

Fig.S9: (A) SWVs of different concentrations of G in PBS of pH4 at In–CeO_2 NPs/GCPE: (1) 0.0, (2) 0.07, (3) 0.32, (4) 0.62, (5) 1.25, (6) 1.77, (7) 2.34, (8) 3.10, (9) 3.85, (10) 4.76, (11) 5.66, (12) 6.89, (13) 8.42, (14) 11.5, (15) 14.0, (16) 17.30, (17) 21.70, (18) 26.70, (19) 30.90 and (20) 34.0 μM G. Accumulation potential, +0.1 V; accumulation time, 90s; scan increment, 6 mV; frequency, 80 Hz and pulse height, 25 mV. Inset: Calibration plot of I_P versus [G]

(B) SWVs of different concentrations of A in PBS of pH4.0 at In–CeO_2 NPs/GCPE: (1) 0.0, (2) 1.96, (3) 3.92, (4) 5.87, (5) 11.90, (6) 18.80, (7) 25.0, (8) 33.10, (9) 39.0, (10) 45.50, (11) 53.90, (12) 61.90, (13) 69.60, (14) 77.20 and (15) 88.20 μM A. Frequency, 100 Hz and pulse height, 30 mV. Inset: Calibration plot of I_P versus [A]

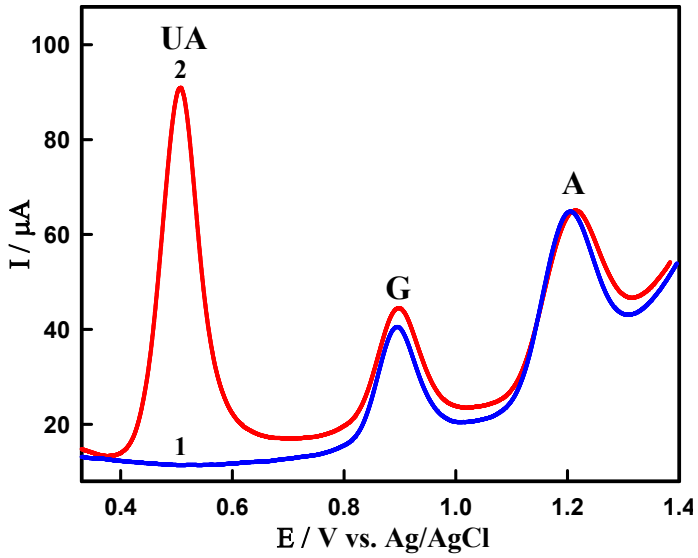

Fig.S10: SW voltammograms for a mixture 31.6 μM G and 55.4 μM A in absence (1) and in presence of 105.7 μM UA (2).

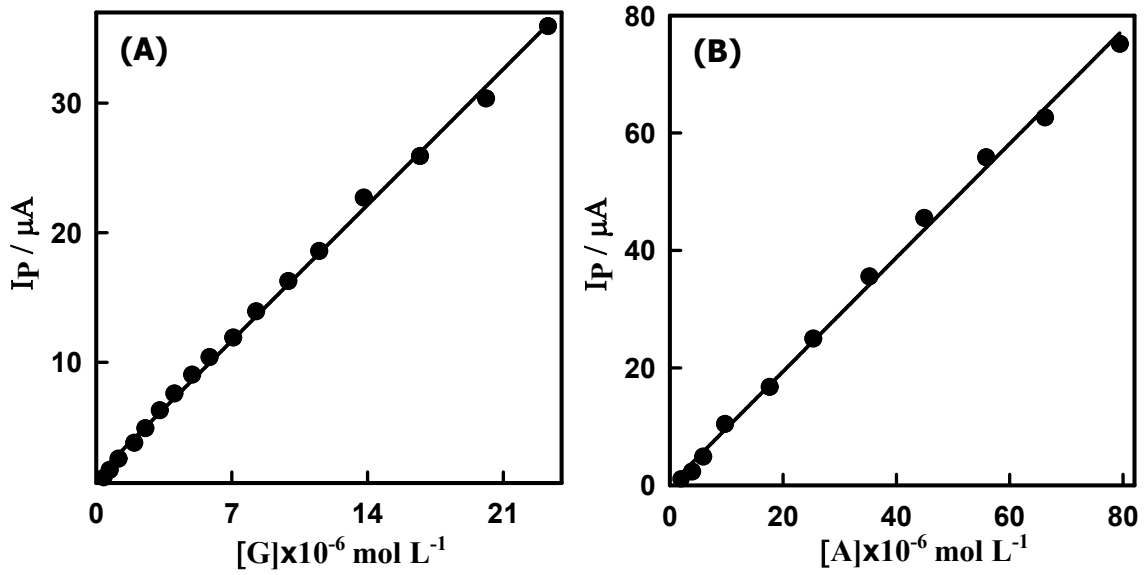

Fig.S11: (A) Calibration plot of I_p(µA) versus [G] and (B) Calibration plot of I_p(µA) versus [A] in PBS (pH 4.0).

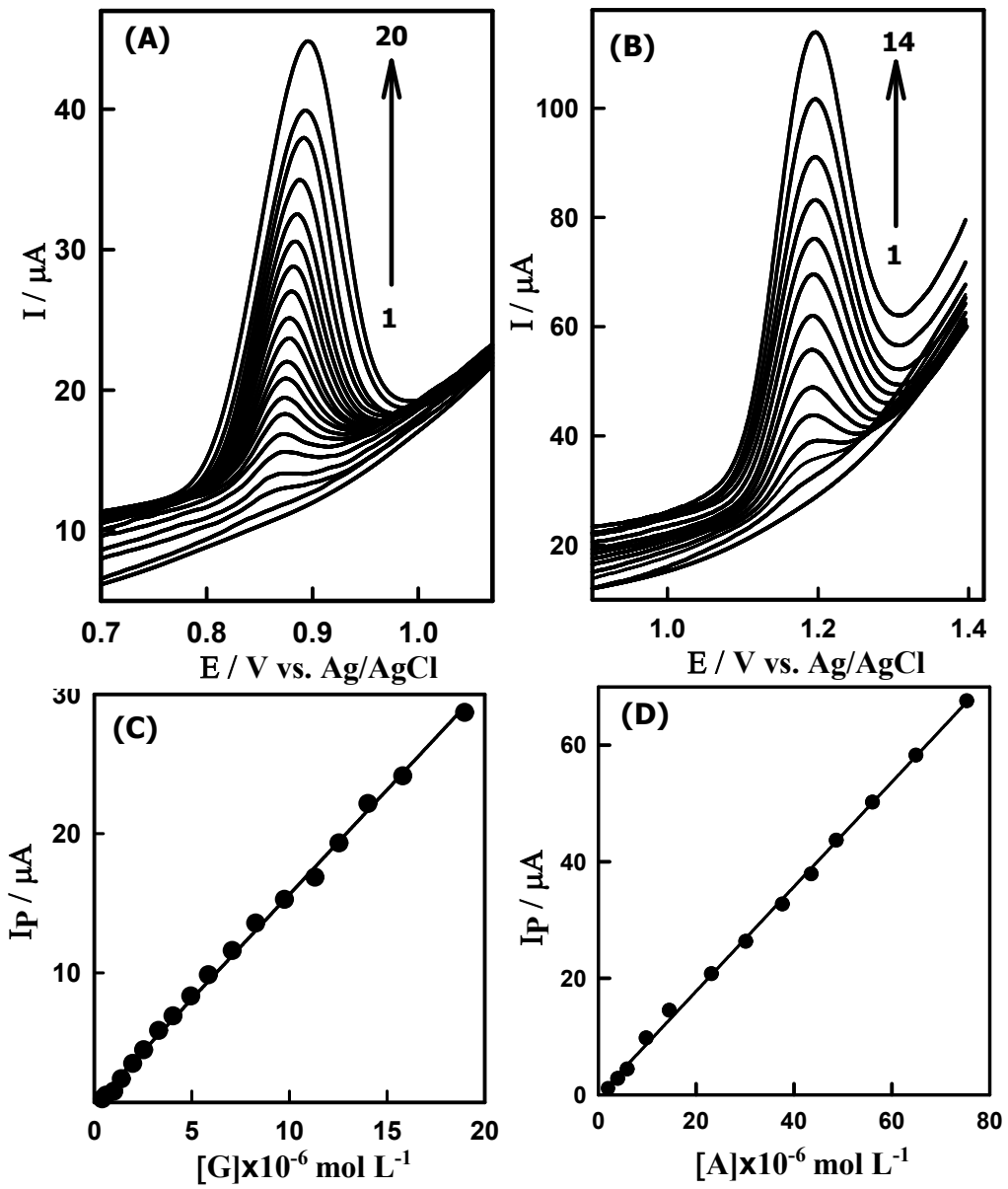

Fig.S12: (A) SWVs for determination of G in urine samples in PBS of pH4.0 at In–CeO_2NPs/GCPE. (1) blank + urine sample, (2) 0.19, (3) 0.39, (4) 0.59, (5) 0.99, (6) 1.38, (7) 1.96, (8) 2.53, (9) 3.29, (10) 4.03, (11) 4.94, (12) 5.84, (13) 7.06, (14) 8.26, (15) 9.74, (16) 11.30, (17) 12.53, (18) 14.01 (19)15.80 and (20) 18.97 µM G.

(B) SWVs for determination of A in urine samples in PBS of pH4.0 at In–CeO_2NPs/GCPE. (1) blank + urine sample , (2) 1.96, (3) 3.92, (4) 5.87, (5) 9.74, (6) 14.50, (7) 23.10, (8) 30.10, (9) 37.60, (10) 43.50, (11) 48.60, (12) 56.0, (13) 64.90 and (14) 75.30 µM A.

(B) Calibration plot of I_p versus [G] (C) Calibration plot of I_p versus [A]

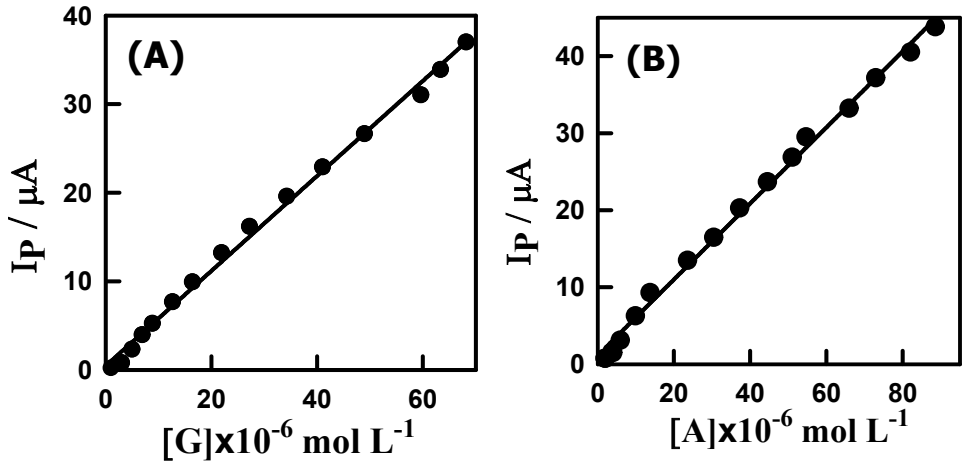

Fig.S13: (A) Calibration plot of I_p versus [G] (B) Calibration plot of I_p versus [A]

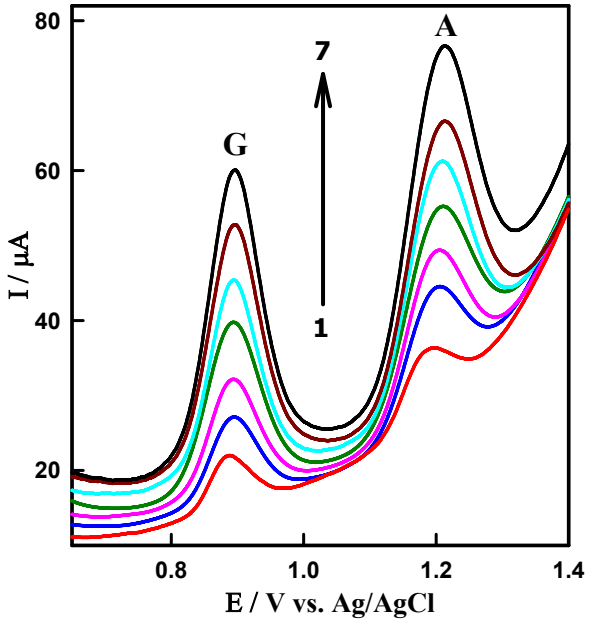

Fig.S14: SWVs for In–CeO_2NPs/GCPE in PBS (pH5.0) containing different concentrations of G + A spiked in ssDNA sample, (1) to (7): (1) ssDNA sample, (2) 11.60 + 17.40, (3) 15.40 + 23.10, (4) 20.90 + 30.40, (5) 26.20 + 37.50, (6) 33.10 + 46.0, (7) 39.70 + 55.20µM, respectively.

Table S1:

Regression data of the calibration lines for quantitative determination of guanine in standard solution, serum sample and urine sample in PBS (pH 4.0) at In–CeO_2NPs/GCPE using SWV.

Parameters	Standard solution	Serum sample	Urine sample
Measured potential (V)	0.864	0.862	0.869
Linearity range (μM)	0.07 – 34.0	0.39 – 23.30	0.19 – 18.97
Slope ($\mu A \mu M^{-1}$)	1.76	1.50	1.52
SE of slope	0.012	0.017	0.016
Intercept (μA)	0.499	1.20	0.610
SE of intercept	0.17	0.18	0.14
Determination coefficient (R^2)	0.9993	0.9980	0.9980
Number of data points	19	17	19
LOD (M)	1.19×10^{-8}	1.80×10^{-8}	1.48×10^{-8}
LOQ (M)	3.98×10^{-8}	6.0×10^{-8}	4.93×10^{-8}
Repeatability of peak current (RSD%) for 3.10 µM	1.80	2.30	2.15
Reproducibility of peak current (RSD%) for 3.10 µM	2.10	2.48	2.38

Table S2:

Regression data of the calibration lines for quantitative determination of adenine in standard solution, serum sample and urine sample in PBS (pH 4.0) at In–CeO_2NPs/GCPE using SWV.

Parameters	Standard solution	Serum sample	Urine sample
Measured potential (V)	1.179	1.158	1.190
Linearity range (μM)	1.96 – 88.20	1.96 – 79.40	1.96 – 75.30
Slope ($\mu A \mu M^{-1}$)	0.84	0.97	0.89
SE of slope	0.0085	0.0172	0.0095
Intercept (μA)	-0.028	-0.001	-0.17
SE of intercept	0.390	0.690	0.380
Determination coefficient (R^2)	0.9988	0.9972	0.9988
Number of data points	14	11	13
LOD (M)	2.86×10^{-8}	2.88×10^{-8}	2.91×10^{-8}
LOQ (M)	9.54×10^{-8}	9.59×10^{-8}	9.69×10^{-8}
Repeatability of peak current (RSD%) for 5.87 μM (n = 5)	1.13	1.34	1.27
Reproducibility of peak current (RSD%) for 5.87 μM (n = 5)	1.25	1.57	1.68

Table S3:

The influences of some important biological substances on the peak currents of 4.94 μM guanine and 5.91 μM adenine in PBS (pH 4.0) at the In-CeO_2NPs/ GCPE.

Interferent	Concentration (μM)	Signal change	
		G %	A %
Ascorbic acid	200	2.17	-2.05
Dopamine	50	-3.11	-2.88
Sucrose	250	-1.25	-1.42
Cysteine	40	1.75	1.94
Glucose	300	-1.12	-1.24
Citric acid	100	1.45	1.51
Histidine	200	-1.35	-1.21
Serine	200	-1.05	-1.14
Alanine	200	2.10	1.57
Phenylalanine	100	-2.41	-2.61

Table S4:

Quantification of guanine and adenine in human serum samples

Samples	Added (μM)		Found[a] (μM)		Recovery %	
	G	A	G	A	G	A
1	1.96	3.92	1.94 ± 0.013	3.90 ± 0.017	98.97	99.49
2	2.53	5.87	2.56 ± 0.015	5.85 ± 0.011	101.20	99.66
3	3.28	9.74	3.22 ± 0.024	9.71 ± 0.020	98.17	99.69
4	4.95	17.60	4.88 ± 0.031	17.55 ± 0.040	98.58	99.71

[a]Mean ± standard deviation (n = 4)