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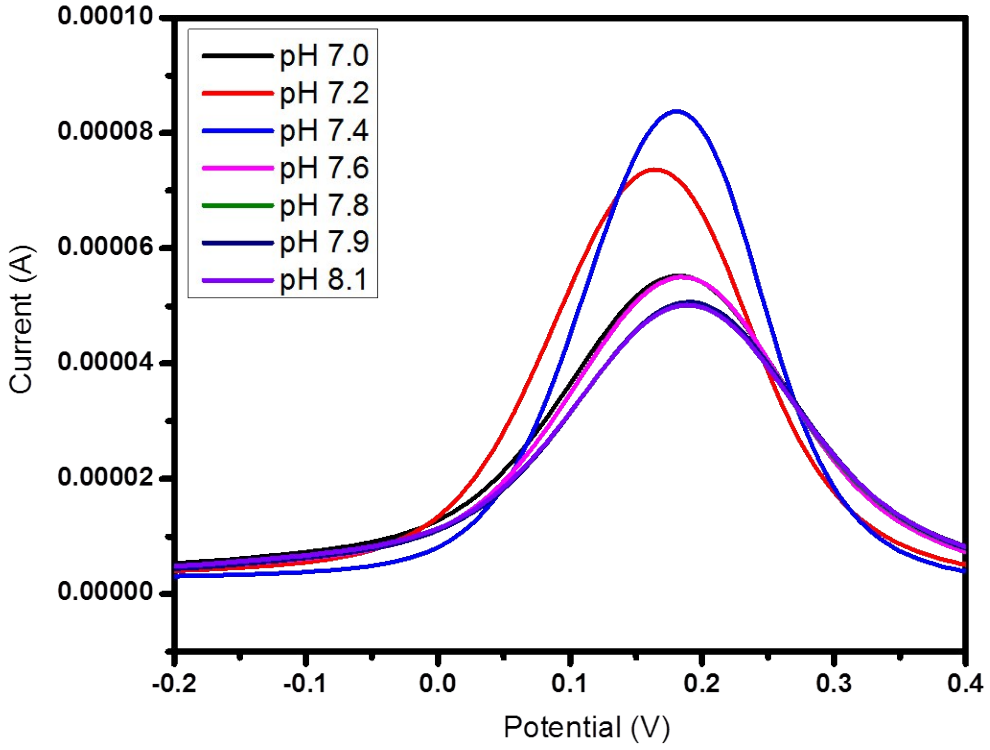
Cubic CeO_2 planted reduced graphene oxide based highly sensitive biosensor for non-invasive oral cancer biomarker

Namrata Pachauri[1 ϕ], Kashyap Dave[1 ϕ], Amit Dinda, Pratima R Solanki[1]*
[1]Special Centre for Nanoscience, Jawaharlal Nehru University, New Delhi-110067 India
[2]All India Institute of Medical Sciences, New Delhi-110608, India
E-mail: pratimarsolanki@gmail.com, partima@mail.jnu.ac.in; Tel: +91-11-26704740

ϕ: Both are equal contributors.

Supplementary Data



FigureS1: pH optimization on BSA/Anti-Cyfra-21-1/ncCeO_2-RGO /ITO

Electrochemical Response Studies

Equations

$$K_e = \frac{RT}{n^2 R_{ct} A C F^2}$$

(S1)

Where; R is gas constant (J. mol.$^{-1}$ K.$^{-1}$), T is temperature (°K), n is number of electrons participated, R_{ct} is charge transfer resistance (Ω), A is electroactive area (cm^{-2}) over the electrode, C is concentration (M) of the electrolyte solution, and F is the Faraday constant (C mol^{-1}).

$$\tau = R_{ct}.\ C_{dl} \quad \text{(S2)}$$

Where; R_{ct} (Ω) is charge transfer resistance, and C_{dl} (farad) is diffusion layer capacitance

$$I_{pa}(ncCeO_2\text{-}RGO/ITO)=0.029\ mA(s/mV)x[scan\ rate;\ mV/s)^{1/2}]+0.019, R^2=0.99 \quad \text{(S3)}$$

$$I_{pc}(ncCeO_2\text{-}RGO/ITO)=-0.021\ mA(s/mV)\ x\ [scan\ rate\ (mV/s)^{1/2}]\ -0.035,\ R^2 = 0.99 \quad \text{(S4)}$$

I_{pa}(BSA/Anti-Cyfra-21-1/ncCeO$_2$-RGO/ITO)=0.028mA(s/mV)x [scan rate; mV/s)$^{1/2}$] +0.029 mA, R^2=0.99 (S5)

I_{pc}(BSA/Anti-Cyfra-21-1/ncCeO$_2$-RGO/ITO)=-0.019 mA (s/mV) x [scan rate; (mV/s)$^{1/2}$]–0.047 mA, R^2 = 0.99 (S6)

$$I_p = (2.69 \times 10^5)\ n^{3/2}\ D^{1/2} A C\ v^{1/2} \quad \text{(S7)}$$

Where; peak current (I_p; in A), number of electron transfer (n; 1), diffusion coefficient (D; cm^2 s^{-1}), surface area of working electrode (A; cm^{-2}), concentration of the redox species in electrolyte solution (C; molar) and scan rate (v; V s^{-1}).

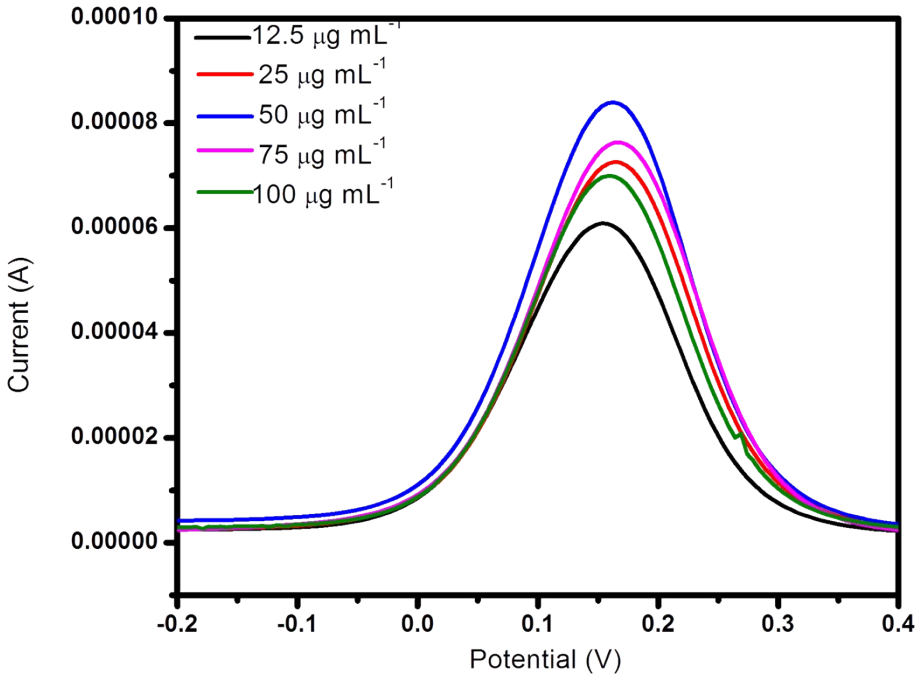


Figure S2: Different concentration of Anti-Cyfra-21-1 optimization on RGO-CeO_2/ITO

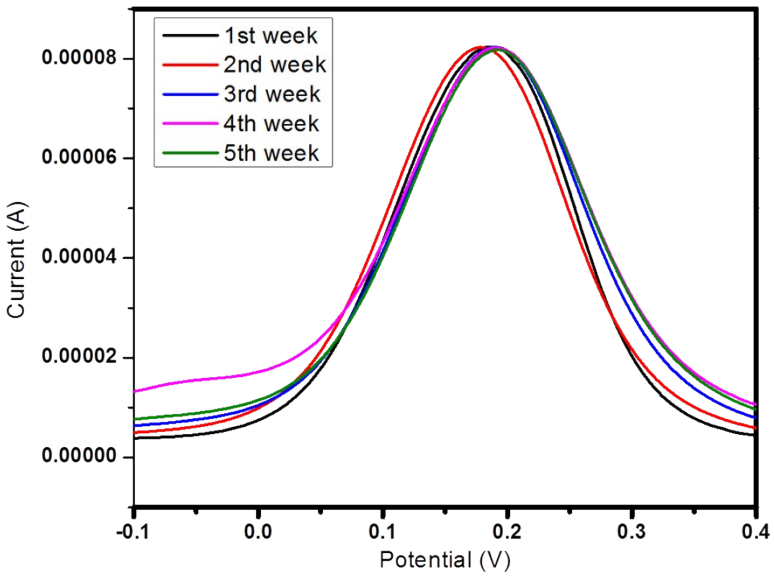


Figure S3: Selectivity curve of Cyfra-21-1 for BSA/Anti-Cyfra-21-1/ncCeO_2-RGO/ITO immunoelectrode

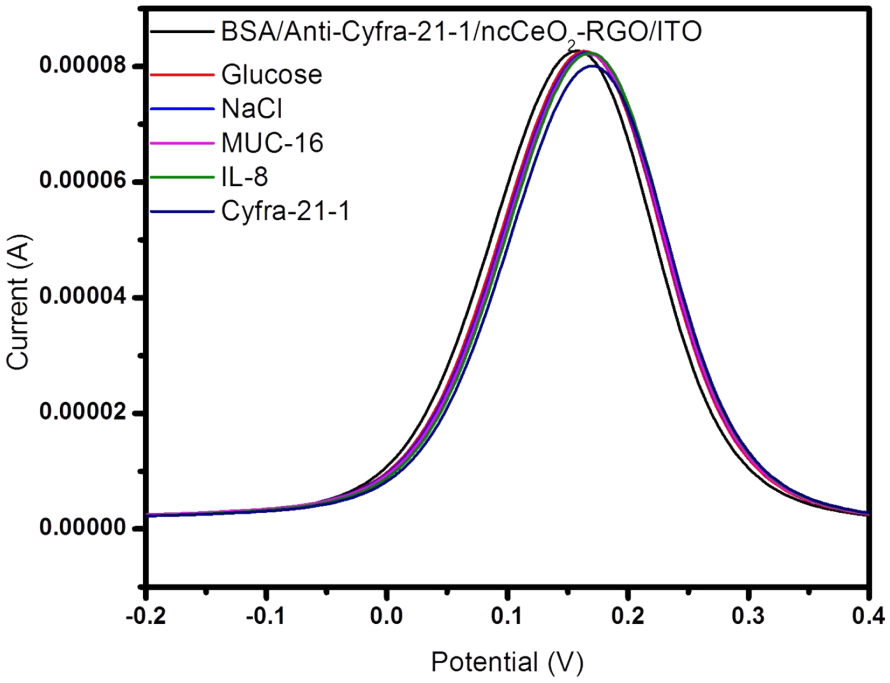


Figure S4: Shelf-life of the BSA/Anti-Cyfra-21-1/ncCeO$_2$-RGO/ITO immunoelectrode.