

## Supplementary Data

### Electrochemical capacitive response studies of BSA/Ab-*Vc*/NwNiO/ITO immunoelectrode.

The electrochemical capacitive response studies of the BSA/Ab-*Vc*/NwNiO/ITO immunoelectrode have been conducted as a function of *Vibrio cholerae* concentration (37-350 ng/ml) in PBS containing  $[\text{Fe}(\text{CN})_6]^{3-/4-}$ . The BSA/Ab-*Vc*/NwNiO/ITO immunoelectrode have been treated with 20  $\mu\text{l}$  of CT and kept for incubation time of about five minutes. It has been observed that the capacitive response is decreases with the increased CT concentration (Fig. A). It may assign to the change in thickness or dielectric/blocking properties of the electrolyte-electrode interface of antibody-antigen (Ab-Ag) interaction (Bataillard et al., 1998; Owino and Sadik 2005). An electrochemical capacitor based immunosensor allows the detection of CT specific to the Ab-*Vc* has been immobilized on the insulating NiO dielectric layer.

The electric capacitance between the NwNiO based immunoelectrode and the electrolyte is  $= \frac{\epsilon\epsilon_0 A}{d}$ , where  $\epsilon_0$  ( $\text{Fm}^{-1}$ ) is the permittivity of free space,  $\epsilon$  is the relative dielectric constant,  $A$  ( $\text{m}^2$ ) is the surface area and  $d$  (m) is the distance. A decrease of the total capacitance, due to the increase of the distance between the electrode and electrolyte is thus expected upon the binding of the CT to Ab-*Vc*. However, the interactions between Ab-*Vc* and CT causes decrease of the measuring capacitance since less polar protein (CT) molecules replace water molecules from the electrode surface.

This immunosensor calibration curve exhibits a linear fit as  $C_{dl}(F) = 74(\mu\text{F}) + 0.275 \text{ nF} / \text{ng ml}^{-1} \times \text{CT concentration}$ . The capacitive immunosensor was calibrated by

plotting the change in capacitive response vs the analyte concentration. A linear relationship is observed from 37 ng/ml to 350 ng/ml. The sensitivity obtained as  $1.12 \text{ nF/ng ml}^{-1} \text{ cm}^{-2}$  with standard deviation  $5.3 \times 10^{-7}$ .

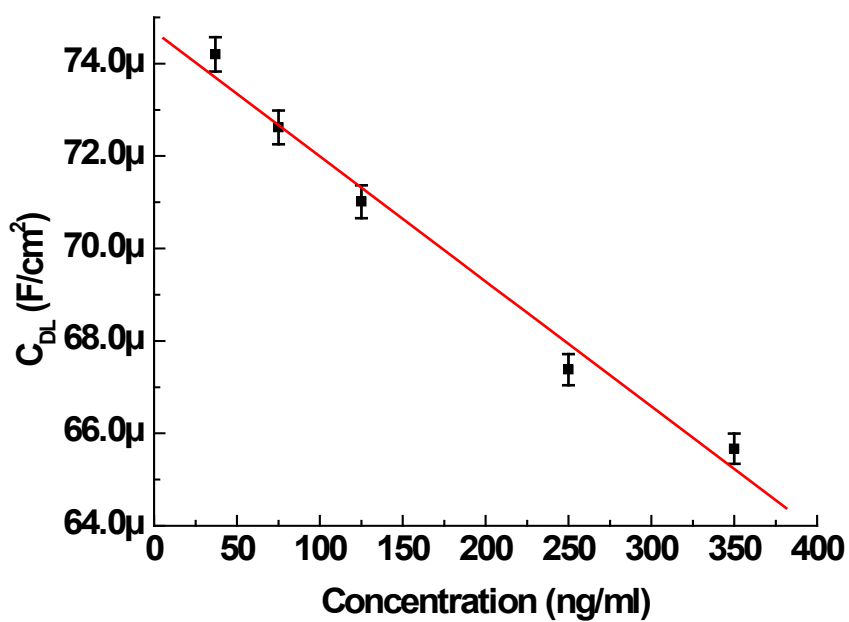


Fig. A . Inset shows plot between double layer capacitance vs CT concentrations.

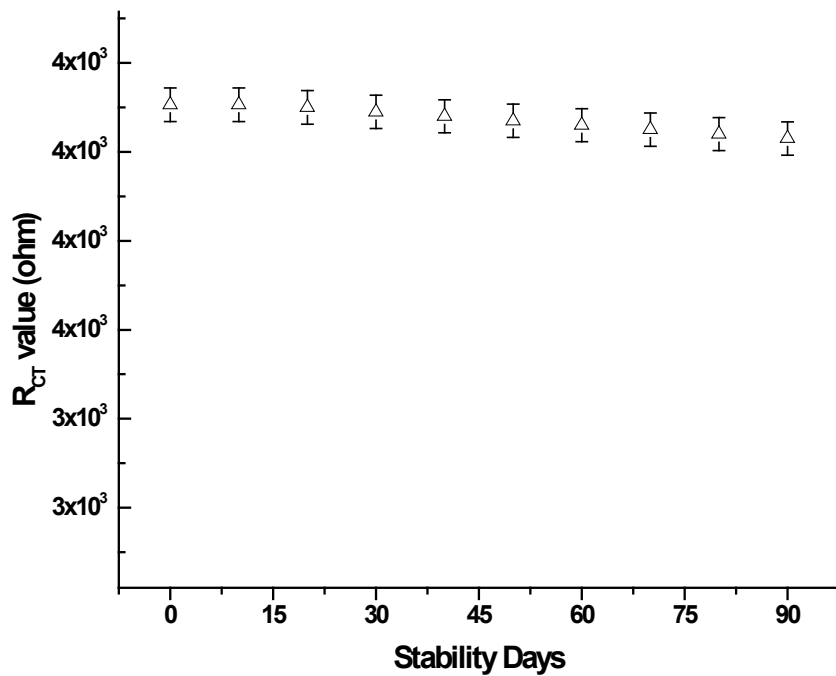


Fig. B. A stability studies of the BSA/Ab-*Vc*/NwNiO/ITO immunoelectrode