Supplementary material

Poly (3-amino phenyl boronic acid) functionalized carbon nanotubes based chemiresistive sensors for detection of sugars

Sushmee Badhulika[a], Chaker Tlili [b] and Ashok Mulchandani [b,]*

Preparation protocol for SWNTs suspension

A uniformly dispersed SWNTs suspension was prepared by ultrasonicating0.10mg SWNTs in 10 mL dimethylformamide (DMF) for 90 min (VWR model 50D, power level 9) followed by centrifugation at 10,000 rpm for 90 min to separate larger aggregates. The supernatant was carefully removed and sonicated for an additional 30 min before use. In order to obtain consistent sensing results, devices which had resistance in the range of 20 KΩ to 30 kΩ after annealing were electropolymerized. The device resistance was determined by the nanotubes concentration and alignment time. Increase in the SWNT concentration and alignment time resulted in a high density of SWNTs between the electrodes during dielectrophoresis thus reducing the initial resistance of the sensors to a few hundred ohms. As a result, change in resistance during sensing cannot be measured with accuracy and precision.

Electropolymerization of PABA

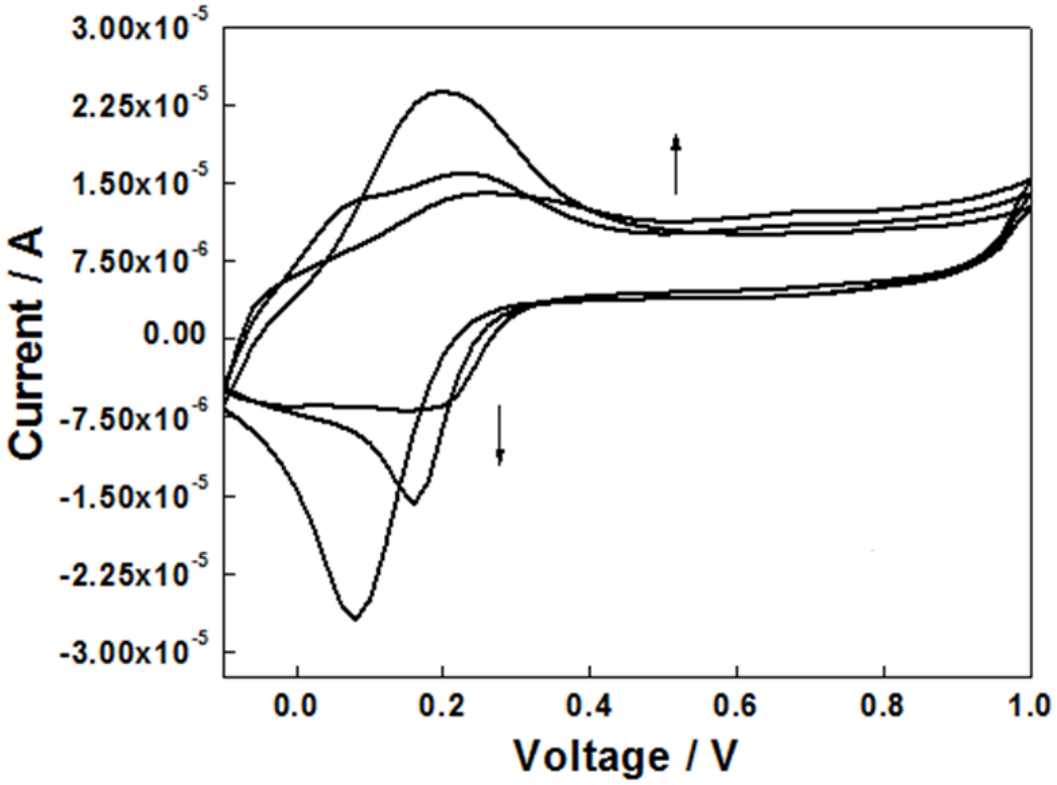

Fig. S1. Cyclic voltammogram of 40 mM 3-aminophenylboronic acid in 10X PBS plus 300 mM NaF; pH 5. Scan rate: 100 mV /s showing continuous polymer growth.

Sigmoidal curve fitting to the sensing data:

The response curves for D-fructose (Figure 5) and D-glucose (Figure 6) with the corresponding sigmoidal fit exhibited correlation coefficient (R^2) of 0.9905 and 0.9930, respectively. The curves are mathematically defined by equation:

$$y = \frac{A_1 - A_2}{1 + e^{(x - x_0)/dx}} + A_2$$

where y is $\Delta R/R_0$ (%) and x is the glucose concentration.

The best fit to the D-fructose data yielded A1 = -1.74 ± 2.37%, A2= 30.52 ± 1.21%, x_0= 4.76 mM ± 0.35 mM, and dx = 1.67 mM ± 0.36 mM and a correlation coefficient of 0.9905.

The best fit to the D-glucose data yielded A1 = -2.52 ± 0.99%, A2= 27.94 ± 1.14%, x_0= 5.29 mM ± 0.19 mM , and dx = 1.66 mM ± 0.24 mM and a correlation coefficient of 0.9930.