Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information

$BiVO_4$ Nanofiber-Based Field-Effect Transistors for Detection of Epinephrine/Adrenaline Hormones

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S1. Preparation of real time urine samples and Epinephrine samples

Phosphate buffer solution (pH 7.2) was prepared by mixing 6.844 mM of NaCl, 1.34 mM of KCl, 0.507 mM of Na_2HPO_4 and 8.81 mM of KH_2PO_4 in 0.2 mL of DI water. Urine samples were collected from a 24-year adult. 2 mL of the urine sample was taken and diluted with 10-fold-0.1 M PBS of pH -7.2 and used for real time sensing applications. Various concentrations of epinephrine samples were prepared in phosphate buffer solution for sensing studies and for real time analysis.

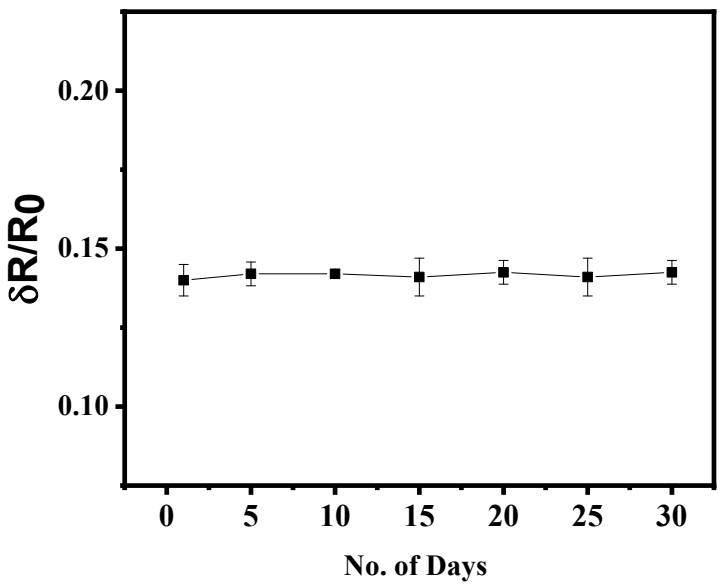

Figure S1. Stability and reusability test of FET biosensor for 30 days.

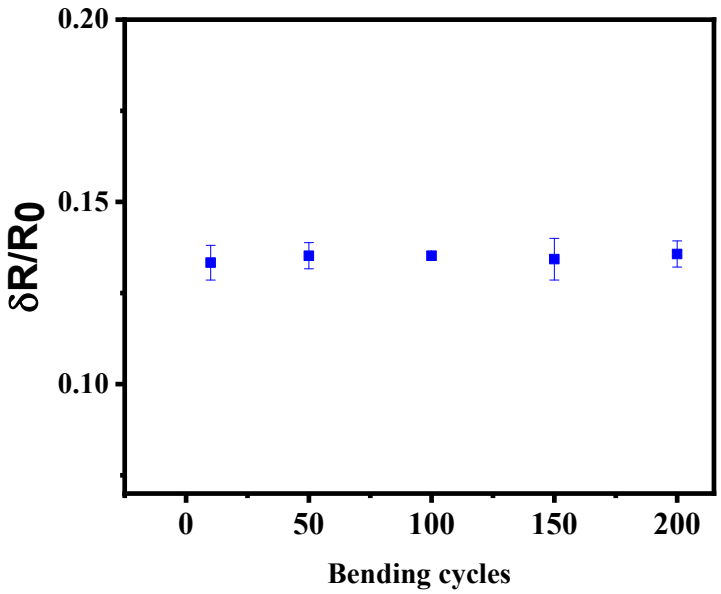

Figure S2. Flexibility studies of FET biosensor for over 200 cycles.

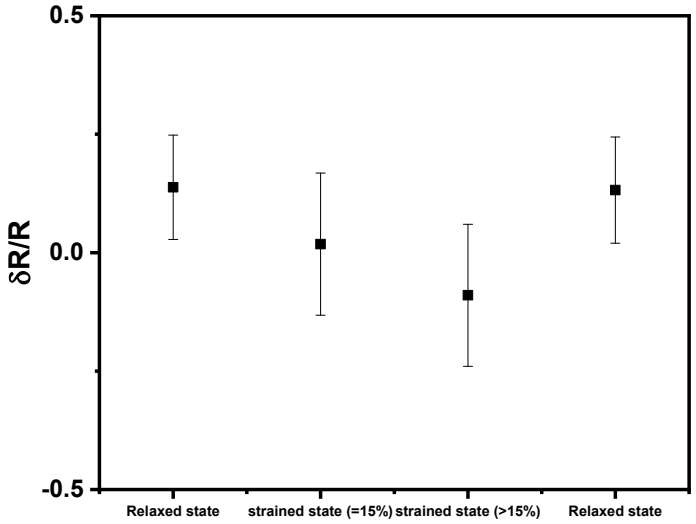

Figure S3. The normalised response of the sensor under relaxed state and strained conditions

Section S2. Total cost of the device

1. Cost of Aluminium foil substrate – $ 0.014

2. Cost of Cr/Ti - $ 1.80

3. Cost of chemicals used per device -

Bismuth nitrate pentahydrate, Ammonium metavanadate, Citric acid, Polyvinylpyrrolidone – $ 1.12

Product cost per device – cost of substrate + cost of chemicals used = $ 3.00.

Section S3. Effect of Annealing treatment of contacts

The contacts were annealed at 50°C for 5 min. As a result, the carrier mobility increased from 3.24 $cm^2 V^{-1}s^{-1}$ to 5.23 $cm^2 V^{-1}s^{-1}$. An increase in carrier mobility of 61% was achieved. It should also be noted that the carrier mobility decreased drastically at temperatures above 50°C, which can be attributed to the reduction in current flowing through the channel. Further, the sensitivity increased from 86.32 nM^{-1} to 115.2 nM^{-1} in the sensing range of 25 nM – 50 μM, upon annealing of the contacts. This increase in sensitivity can be attributed to the removal of surface oxides in the contact area.