

Supplementary Information

Point-of-care immunosensor for the detection of cancer biomarker based on percolated graphene thin film

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Experimental Section

Reagents and Apparatus

Prostate-specific antigen (PSA) and monoclonal anti-PSA antibody were purchased from Millipore. Graphite and 1-pyrenebutanoic acid, succinimidyl ester (PBSE) were obtained from Fisher Scientific.

Preparation of Graphene

Graphene was prepared from graphite oxide (GO) through a thermal exfoliation method [1]. First, GO powders were produced from graphite using a modified Hummer's method [2]. In a typical experiment, 5 g of graphite was oxidized by reacting them with 100 mL of concentrated H₂SO₄ under stirring for 12 h. Next, while immersing the reaction vessel in an ice bath, 30 g of KMnO₄ was added slowly. After the addition of KMnO₄, the solution was stirred at 100 °C for another 12 h to fully oxidize graphite to GO. The GO was then thoroughly washed and dried. The resulting GO was exfoliated thermally in a quartz tube. An argon inlet was then inserted through the tube. The quartz

tube was fluxed with argon for 10 min, and then quickly inserted into a furnace preheated to 300 °C and held in the furnace for about 7 min.

Fabrication of the immunosensor

To fabricate the immunosensor, 50 μL of graphene solution was added onto a confined polycarbonate surface (1 cm \times 1 cm) and was subsequently dried. Subsequently, after washing, PBSE solution (0.5 mg/mL) was added onto the graphene film surface and incubated for 1 h. Thereafter, the immunosensor was immersed in anti-PSA antibody solution (50 μg) for 1 h. The immunosensor was then washed and incubated in 1 wt % BSA solution for 0.5 h to eliminate nonspecific binding. After that, PSA buffer solution with a varying concentration was added onto the immunosensor surface and incubated for 1 h at room temperature.

To measure the resistance, after each modification step, the immunosensor was washed extensively and totally dried. The resistance changes before and after the incubation with PSA was recorded as signal to different concentration of PSA.

References

- [1] M.J. McAllister, J.L. Li, D.H. Adamson, H.C. Schniepp, A.A. Abdala and J. Liu, Chem. Mater. 2007, **19**, 4396.
- [2] Z. Liu, J.T. Robinson, X.M. Sun, H.J. Dai, J. Am. Chem. Soc. 2008, 130, 10876.

Supporting Figures

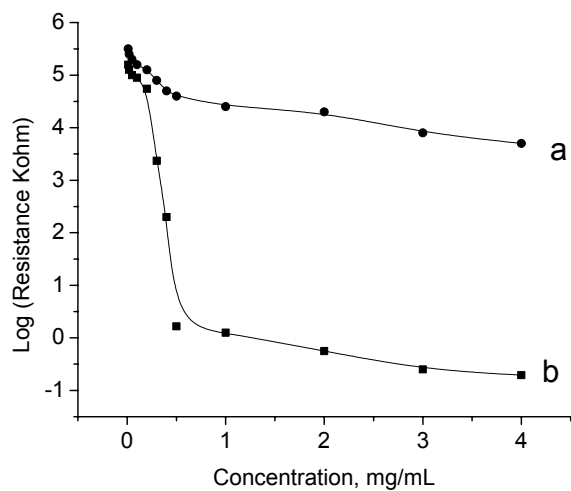


Fig. S1 Film resistance as a function of graphite oxide (a) and graphene (b)
concentration