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A paper based graphene-nanocauliflower hybrid composite for point of care biosensing

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1 **A paper based graphene-nanocauliflower hybrid composite for point of care**
2 **biosensing**

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11 **Abstract**

12 We demonstrate the first report of graphene paper functionalized with fractal
13 platinum nanocauliflower for use in electrochemical biosensing of small molecules
14 (glucose) or detection of pathogenic bacteria (*Escherichia coli* O157:H7). Raman
15 spectroscopy, scanning electron microscopy and energy dispersive spectroscopy show
16 that graphene oxide-coated nanocellulose was partially reduced by both thermal
17 treatment, and further reduced by chemical treatment (ascorbic acid). Fractal
18 nanoplatinum with cauliflower-like morphology was formed on the reduced graphene
19 oxide paper using pulsed sonoelectrodeposition, producing a conductive paper with an
20 extremely high electroactive surface area ($0.29 \pm 0.13 \text{ cm}^2$), confirmed by cyclic
21 voltammetry and electrochemical impedance spectroscopy. The platinum surface was
22 functionalized with either glucose oxidase (via chitosan encapsulation) or a RNA
23 aptamer (via covalent linking) for demonstration as a point of care biosensor. The

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