

Flexible, Non-enzymatic FET Glucose Sensor Based on NiO Quantum Dots Decorated ZnO Nanorods on Polyimide

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We have designed non-enzymatic flexible field-effect-transistor (f-FET) glucose sensor by growing ZnO nanorods (NRs) between the source-drain on polyimide. Then, pristine ZnO NRs were modified with NiO quantum dots (QDs) by RF magnetron sputtering in order to enhance the electrocatalytic features and the surface area of ZnO NRs. Further, the structural, optical and compositional characterizations of ZnO NRs before and after NiO QDs decoration were performed using methods such as field-emission scanning electron microscopy, transmission electron microscope and X-ray diffraction, etc. The NiO QDs decorated ZnO NRs based f-FET nonenzymatic sensor showed two linear ranges of 0.001–10 mM and 10–50 mM with high sensitivity of $13.137 \mu\text{A cm}^{-2} \text{mM}^{-1}$ and $7.309 \mu\text{A cm}^{-2} \text{mM}^{-1}$, respectively. A low detection limit was estimated to be 0.26 mM. The sensor also showed good stability and repeatability during glucose detection. Rivalling the state-of-the-art nanomaterial based biosensors, our designed non-enzymatic f-FET glucose sensor presents exciting potential for practical applications in clinical and industrial sectors.