Highly-sensitive Cholesterol Biosensor Based on Well-crystallized Flower-shaped ZnO Nanostructures

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Abstract:

This paper reports the fabrication of highly sensitive cholesterol biosensor based on cholesterol oxidase (ChOx) immobilization on well-crystallized flower-shaped ZnO structures composed of perfectly hexagonal-shaped ZnO nanorods grown by low-temperature simple solution process. The fabricated cholesterol biosensors reported a very high and reproducible sensitivity of 61.7 μAμM-1cm-2 with a response time less than 5 sec and detection limit (based on S/N ratio) of 0.012 μM. The biosensor exhibited a linear dynamic range from 1.0 ~ 15.0 μM and correlation coefficient of R = 0.9979. A lower value of apparent Michaelis-Menten constant (Kmapp), of 2.57 mM, exhibited a high affinity between the cholesterol and ChOx immobilized on flower-shaped ZnO structures. Moreover, the effect of pH on ChOx activity on the ZnO modified electrode has also been studied in the range of 5.0 ~ 9.0 which exhibited a best enzymatic activity at the pH range of 6.8 - 7.6. To the best of our knowledge, this is the first report in which such a very high-sensitivity and low detection limit has been achieved for the cholesterol biosensor by using ZnO nanostructures modified electrodes.

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