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_A_M−1 cm−2 with a response time less than 5 s and detection limit (based on S/N ratio) of 0.012_M. The biosensor exhibited a linear dynamic range from1.0–15.0_Mand correlation coefficient of R = 0.9979. A lower value of apparent Michaelis–Menten constant (Km app), of 2.57mM, 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.