Electronic Supplementary Information

Regulating the hydrothermal synthesis of ZnO nanorods to optimize the performance of spirally hierarchical structure-based glucose sensors

W. X. Jing,*[a] F. Zhou,[a] W. Z. Gao,[a] Z. D. Jiang,[a] W. Ren,[b] J. F. Shi,[a] Y. Y. Cheng[a] and K. Gao[a]

[a]*State Key Laboratory for Manufacturing Systems Engineering at Xi'an Jiaotong University, Xi'an 710049, China*

[b]*Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education, International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China*

*Corresponding author. Tel.: +86-138 9193 8590

E-mail: wxjing@mail.xjtu.edu.cn

A. ZnO nanorods fabricated with the 2nd and 3rd set of the synthesizing parameters as well as the surface height profiles of the spirally hierarchical structures of the 2nd and 3rd batch

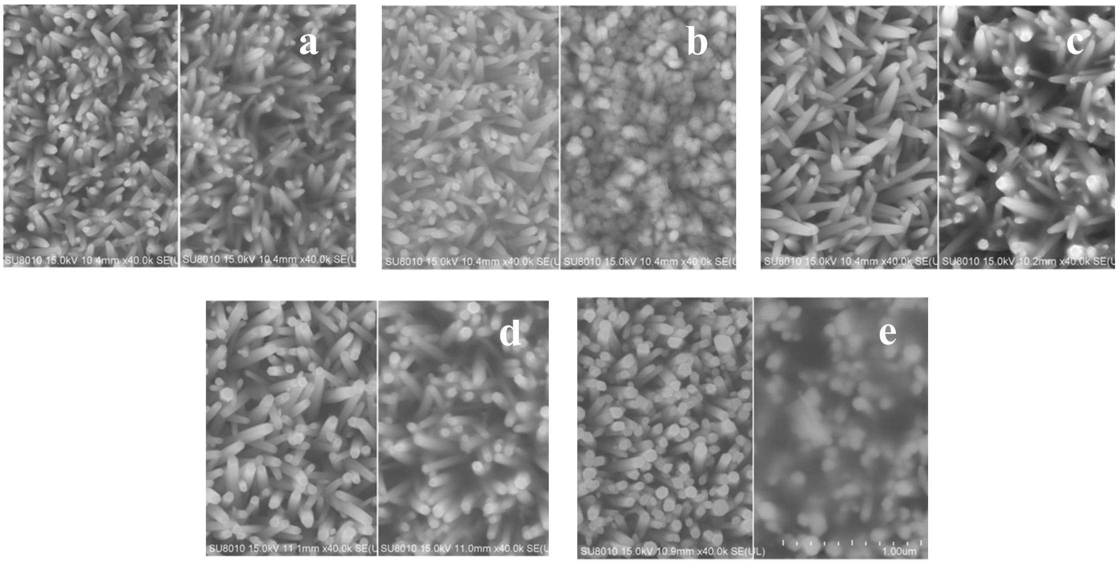

Fig. S1 ZnO nanorods fabricated with the 2nd set of the synthesizing parameters. The left SEM micrographs represent the ZnO nanorods synthesized for 0.5 (a), 1 (b), 1.5 (c), 2.5 (d) and 6 (e) h of the growth duration respectively, whilst the right ones the corresponding ZnO nanorods with GOx.

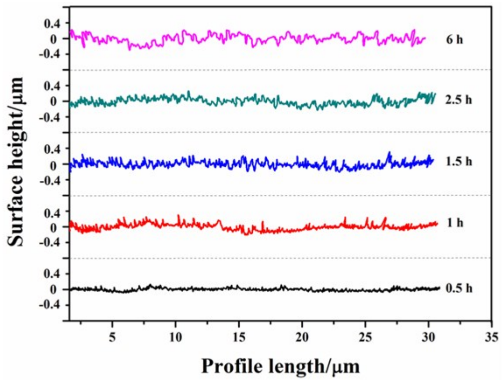

Fig. S2 Surface height profiles of the spirally hierarchical structures fabricated with the 2nd set of the synthesizing parameters, that is, the growth duration 0.5, 1.0, 1.5, 2.5 and 6h.

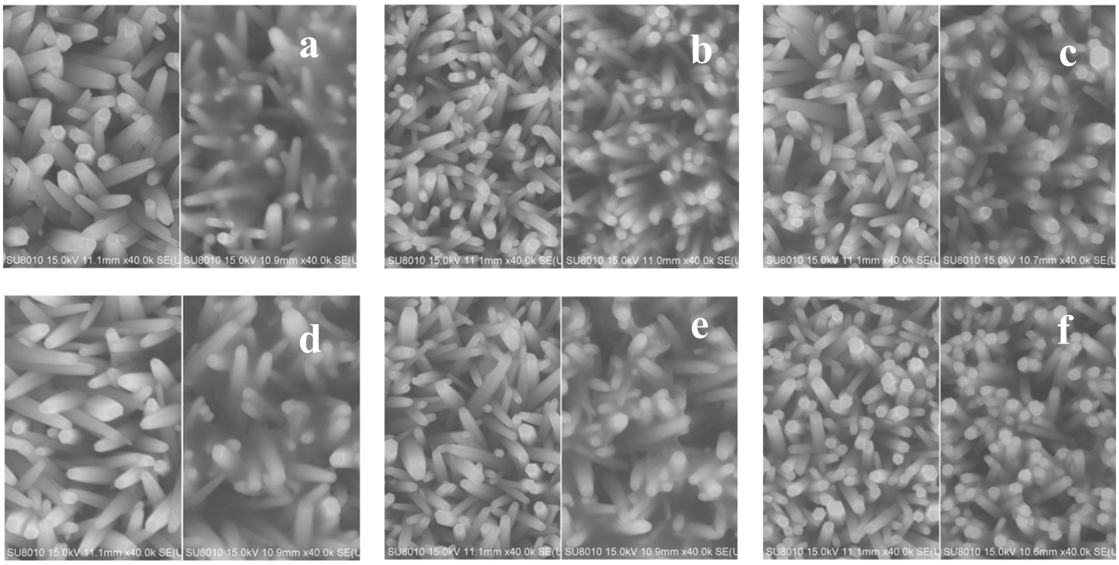

Fig. S3 ZnO nanorods fabricated with the 3rd set of the synthesizing parameters. The left SEM micrographs represent the ZnO nanorods synthesized at Zn^{2+} concentration 0.5 (a), 1 (b), 2 (c), 3 (d), 4 (e) and 5 (f) mM of the seed solution respectively, whilst the right ones the corresponding ZnO nanorods with GOx.

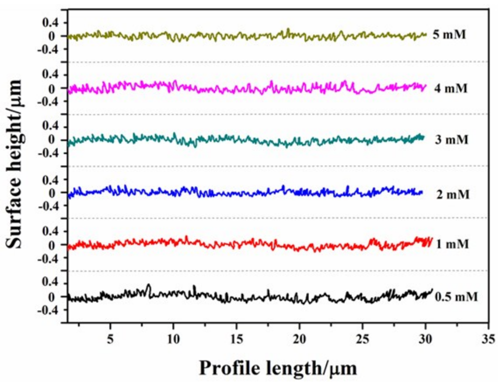

Fig. S4 Surface height profiles of the spirally hierarchical structures fabricated with the 3rd set of the synthesizing parameters, that is, Zn^{2+} concentration 0.5, 1, 2, 3, 4 and 5 mM of the seed solution.

B. Calculation details for the performance parameters of the spirally hierarchical structure-based glucose sensors

1. Sensitivity

The sensitivity of the glucose sensor is derived from the ratio of the slope of the fitted line to the surface area of the spirally hierarchical structure-based working electrode, and is described as equation (1):

$$S = \frac{K}{A} \tag{1}$$

where K is the slope of the fitted line in Fig. 8, and A the surface area of the spirally hierarchical structure-based working electrode.

2. Limit of detection

The limit of detection of the glucose sensor is derived from the ratio of the 3 times standard deviation of the background current to the slope of the fitted line (that is, the 3σ principle), and is described as equation (2):

$$LOD = \frac{3\sigma}{K} \tag{2}$$

where K is the slope of the fitted line in Fig. 8, and σ is the standard deviation (sampling number n=500) of the background current obtained in PBS solution without glucose.

3. Linear range

The lower limit of the linear range of the glucose sensor is the same as the limit of detection, whilst the upper limit of the linear range is the largest glucose concentration which corresponds to the fitted line.

4. Michaelis-Menten constant

The Michaelis-Menten constant of the glucose sensor is decided according to Lineweaver-Burk equation (3) as below,

$$\frac{1}{i} = \frac{K_m^{app}}{i_{\max}} \cdot \frac{1}{C} + \frac{1}{i_{\max}} \tag{3}$$

where i is the response current, i_{max} the maximum response current measured under saturated condition, C the glucose concentration and K_m^{app} the Michaelis-Menten constant.