Supporting Information

Laser-induced Graphene Hybrid Photoelectrode for Enhanced Photoelectrochemical Detection of Glucose

Hui Li, Chengxiang Guo, Changchun Liu, Lei Ge,* and Feng Li*

College of Chemistry and Pharmaceutical Sciences, Qingdao Agricultural University, Qingdao, 266109, People's Republic of China

*Corresponding author: Lei Ge, Feng Li

E-mail: lge@qau.edu.cn, lifeng@qust.edu.cn

Telephone: +86-532-58957855

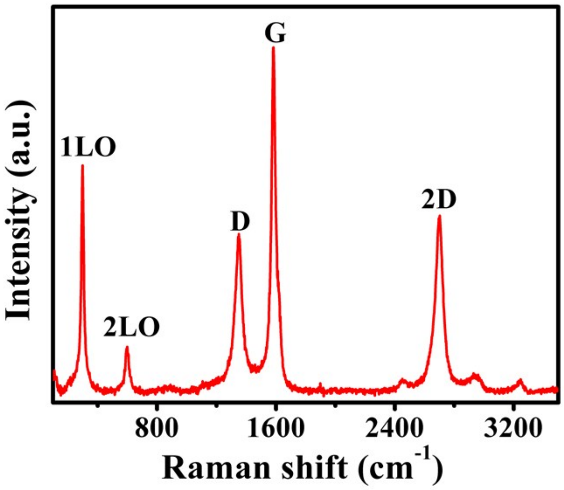

Figure S1. Raman spectrum of LI-NiEC-CdS-G@ITO photoelectrode.

As shown in Figure S1, the clearly identified D (~1350 cm^{-1}), G (~1582 cm^{-1}), and 2D (~2700 cm^{-1}) peaks confirm the existence of defective or multilayered structure that is the characteristic sign of LIG.[1] The two characteristic Raman peaks at ~299 cm^{-1} and ~597 cm^{-1} correspond to the 1LO and 2LO vibration modes of hexagonal LICdS,[2] respectively, suggesting the successful fabrication of both LIG and LICdS in LI-NiEC-CdS-G nanocomposite.

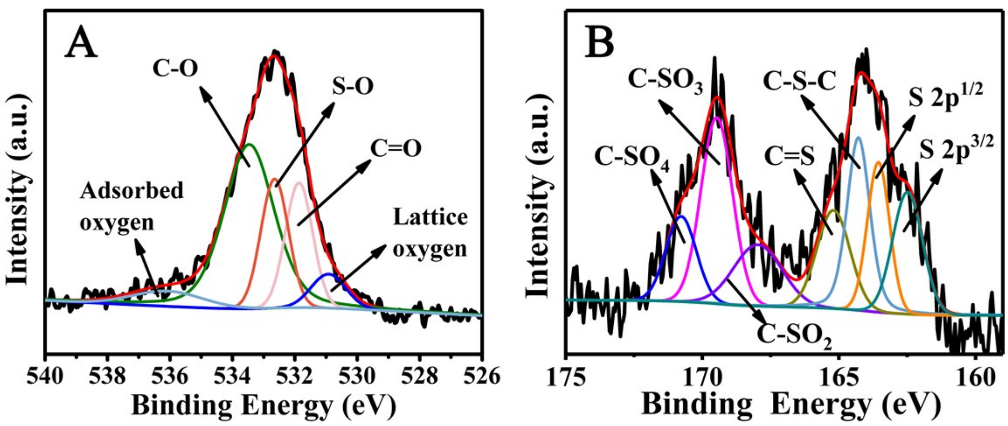

Figure S2. High resolution (A) O 1s and (B) S 2p XPS spectra of LI-NiEC-G@ITO.

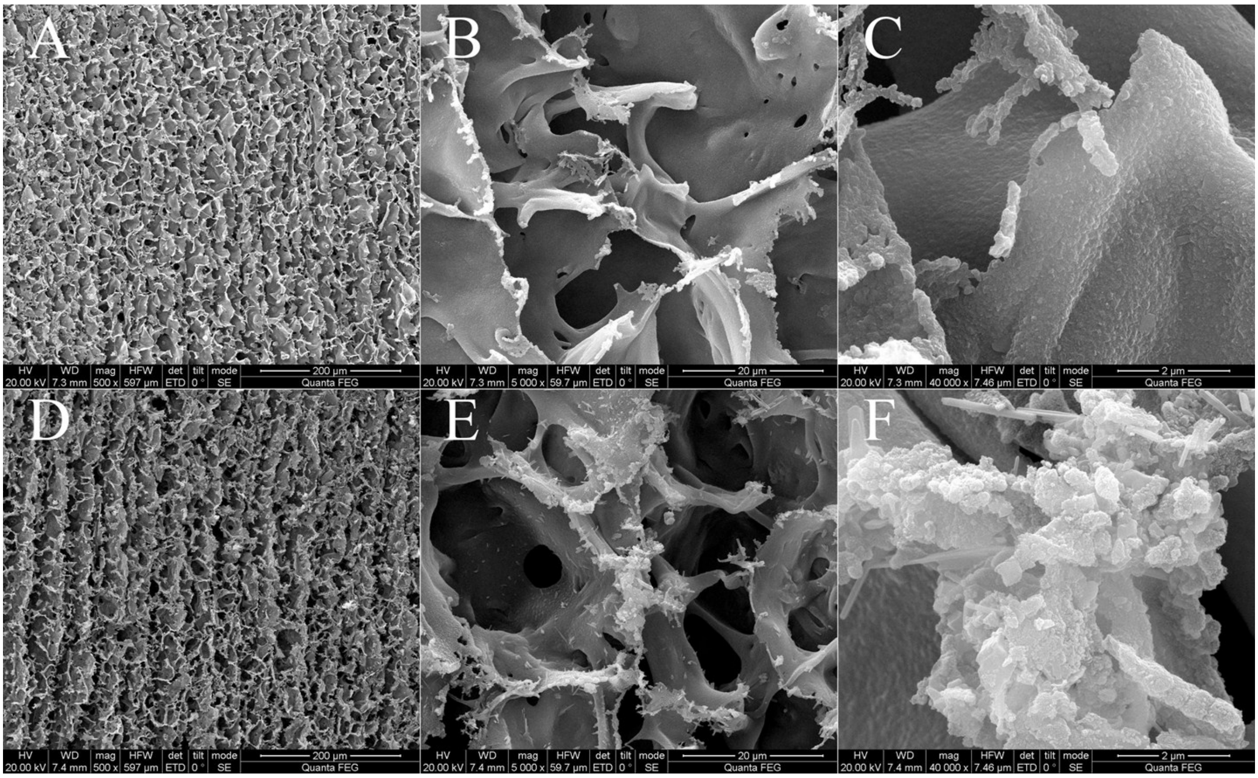

Figure S3. SEM images of (A-C) LIG@ITO and (D-F) LI-CdS-G@ITO photoelectrode with different magnifications.

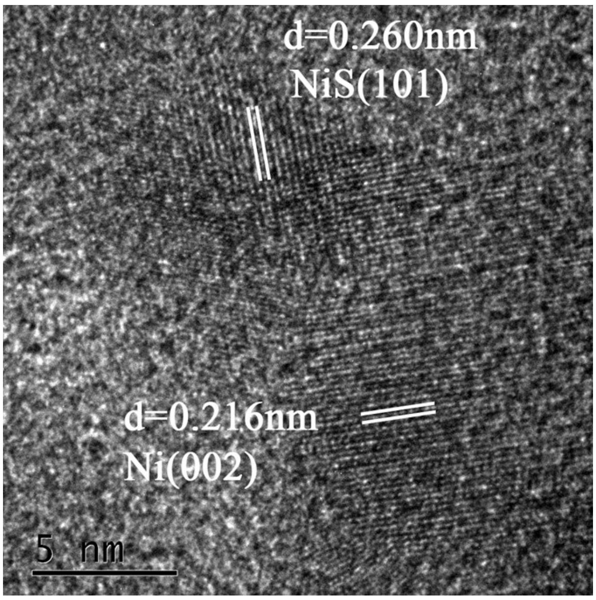

Figure S4. High resolution TEM image of Ni^0-NiS hybrid in LI-NiEC-CdS-G nanocomposite.

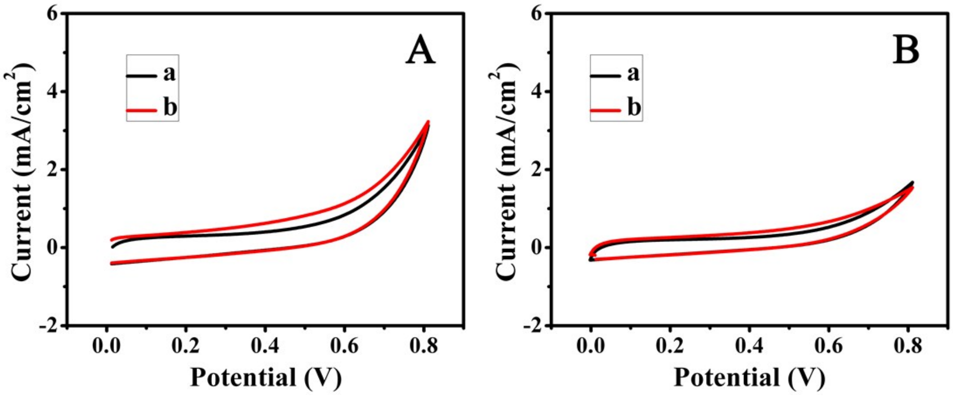

Figure S5. CVs of (A) LIG@ITO and (B) LI-CdS-G@ITO electrode in 0.1 M KOH (a) without and (b) with 1.0 mM glucose at a scan rate of 50 mV/s.

Table S1. Assay performance comparison of our method with other non-enzyme glucose sensors.

Employed electrocatalyst@electrode	Linear range	Detection limit	Reference
NiO/SiC@GCE electrode	4 μM to 7.5 mM	0.32 μM	3
$NiCo_2O_4$@3D graphene foam electrode	500 nM to 0.59 mM	0.38 μM	4
$Ni(OH)_x$ film@carbon cloth electrode	0.004 to 0.6 mM	0.45 μM	5
Ni_3S_2/carbon nanotube@Ni foam electrode	30 to 500 μM	1.0 μM	6
Au/TiO_2@Ti photoelectrode	1 μM to 10 mM	1.0 μM	7
Au/NiAu multilayered nanowire@ITO photoelectrode	0.005 to 31 mM.	1.0 μM	8
Au/graphene/PAPBA/TiO_2@ITO[a]	0.5 to 20 mM & 20 to 28 mM	0.11 mM	9
Ni/CdS@TiO_2 nanotube array photoelectrode	0.1 to 2mM & 3 to 6 mM	7.98 μM	10
Nickel−cobalt phosphate@GCE electrode	2 to 4470 μM	0.4 μM	11
Ni_3Te_2@Ni foam electrode	0.01 to 0.8 mM	0.38 μM	12
Ni/CdS@Ti@TiO_2 core−shell nanowire electrode	0.005 to 12 mM,	0.35 μM	13
Ni-MOF/Ni/NiO/C@GCE nanocomposite electrode	4 to 5664 μM	0.8 μM	14
Carbon nanotube–nickel@GCE electrode	5.0 μM to 2.0 mM	2.0 μM	15
IrO_2/NiO core−shell nanowire@GCEelectrode	0.5 μM to 2.5 mM	0.31 μM	16
Ni nanoparticle@carbon nanofiber paste electrode.	2 μM to 2.5 mM	1.0 μM	17
NiO@Buckypaper electrode	0.1 to 9 mM	14 μM	18
$Ni(OH)_2$ nanosheet@Ni foam electrode	0.46 to 2100 μM.	0.46 μM	19
Ni_3S_2 nanosheet@Ni foam electrode	0.005 to 3.0 mM	1.2 μM	20
NiS/$Ni(OH)_2$-NH_4PA/PPyNTs@GCE electrode[b]	0 to 600 μM	3.1 μM	21
LI-NiEC-CdS-G@ITO photoelectrode	1.0 μM to 1.0 mM	0.4 μM	This work

a PAPBA: poly[3-aminophenylboronic acid]; **b** NH_4PA/PPyNTs: ammonium polyacrylate-functionalized polypyrrole nanotubes

References

1 J. Lin, Z. Peng, Y. Liu, F. Ruiz-Zepeda, R. Ye, E. L. G. Samuel, M. J. Yacaman, B. I. Yakobson and J. M. Tour, *Nat. Commun.*, 2014, **5**, 5714.

2 M. Wang, L. Cai, Y. Wang, F. Zhou, K. Xu, X. Tao and Y. Chai, *J. Am. Chem. Soc.*, 2017, **139**, 4144-4151.

3 P. Yang, X. Tong, G. Wang, Z. Gao, X. Guo and Y. Qin, *ACS Appl. Mater. Interfaces*, 2015, **7**, 4772-4777.

4 M. Wu, S. Meng, Q. Wang, W. Si, W. Huang and X. Dong, *ACS Appl. Mater. Interfaces*, 2015, **7**, 21089-21094.

5 Q. Wa, W. Xiong, R. Zhao, Z. He, Y. Chen and X. Wang, *ACS Appl. Nano Mater.*, 2019, **2**, 4427-4434.

6 T.-W. Lin, C.-J. Liu and C.-S. Dai, *Appl. Catal. B*, 2014, **154-155**, 213-220.

7 L. Guo, Z. Li, K. Marcus, S. Navarro, K. Liang, L. Zhou, P. D. Mani, S. J. Florczyk, K. R. Coffey, N. Orlovskaya, Y.-H. Sohn and Y. Yang, *ACS Sens.*, 2017, **2**, 621-625.

8 L. Wang, W. Zhu, W. Lu, X. Qin and X. Xu, *Biosens. Bioelectron.*, 2018, **111**, 41-46.

9 M. Nallal, G. Anantha Iyengar and K. Pill-Lee, *ACS Appl. Mater. Interfaces*, 2017, **9**, 37166-37183.

10 H. Huo, Z. Xu, T. Zhang and C. Xu, *J. Mater. Chem. A*, 2015, **3**, 5882-5888.

11 Y. Shu, B. Li, J. Chen, Q. Xu, H. Pang and X. Hu, *ACS Appl. Mater. Interfaces*, 2018, **10**, 2360-2367.

12 B. Golrokh Amin, U. De Silva, J. Masud and M. Nath, *ACS Omega*, 2019, **4**, 11152-11162.

13 C. Guo, H. Huo, X. Han, C. Xu and H. Li, *Anal. Chem.*, 2014, **86**, 876-883.

14 Y. Shu, Y. Yan, J. Chen, Q. Xu, H. Pang and X. Hu, *ACS Appl. Mater. Interfaces*, 2017, **9**, 22342-22349.

15 T. Choi, S. H. Kim, C. W. Lee, H. Kim, S.-K. Choi, S.-H. Kim, E. Kim, J. Park and H. Kim, *Biosens. Bioelectron.*, 2015, **63**, 325-330.

16 J. Wang, L. Xu, Y. Lu, K. Sheng, W. Liu, C. Chen, Y. Li, B. Dong and H. Song, *Anal. Chem.*, 2016, **88**, 12346-12353.

17 Y. Liu, H. Teng, H. Hou and T. You, *Biosens. Bioelectron.*, 2009, **24**, 3329-3334.

18 T. Zhu, Y. Zhang, L. Luo and X. Zhao, *ACS Appl. Mater. Interfaces*, 2019, **11**, 10856-10861.

19 W. Mao, H. He, P. Sun, Z. Ye and J. Huang, *ACS Appl. Mater. Interfaces*, 2018, **10**, 15088-15095.

20 H. Huo, Y. Zhao and C. Xu, *J. Mater. Chem. A*, 2014, **2**, 15111-15117.

21 H. Mao, Z. Cao, X. Guo, D. Sun, D. Liu, S. Wu, Y. Zhang and X.-M. Song, *ACS Appl. Mater. Interfaces*, 2019, **11**, 10153-10162.