

Electronic Supplementary Material (ESI) for RSC Advances.

This journal is © The Royal Society of Chemistry 2017

Supporting Information

Gold nanorods on three-dimensional nickel foam: A non-enzymatic glucose sensor with enhanced electro-catalytic performance

Wenqi Liu,^{*,a} Xiaochun Wu,^b and Xiaojin Li^{*,a}

^aQingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, Qingdao 266101, P.R. China

^bCAS Key Laboratory of Standardization and Measurement for Nanotechnology, National Center for Nanoscience and Technology, Beijing 100190, P. R. China

* To whom correspondence should be addressed.

E-mail: liuwq@qibebt.ac.cn

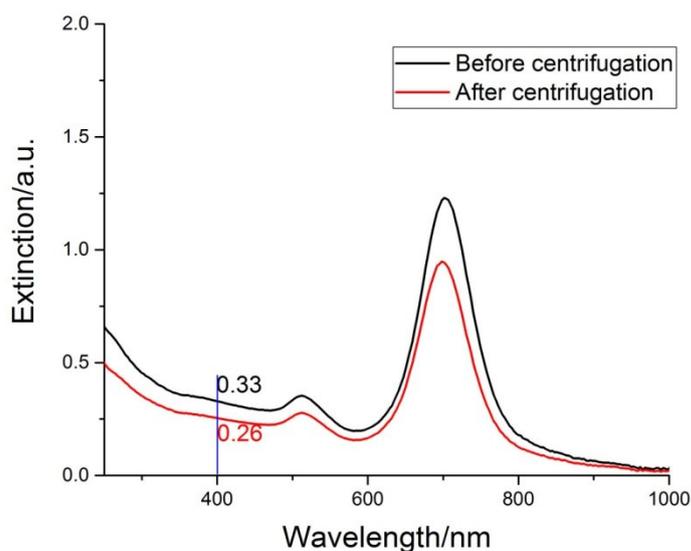


Fig. S1. Extinction spectra of the grown Au NRs before and after centrifugation, diluted 3 and 15 times, respectively.

For Au nanocrystals, the region from 350 to 450 nm in the extinction spectra reflects the interband transitions, which are independent of particle shape, so the extinction value at this range can be used to evaluate the total amount of Au atoms (Ref.1-3). The Au salt precursors supplied in the Au NRs growth solution are 0.5 mM, the extinction spectrum of the grown Au NRs diluted 3 times is shown in new Fig. S1. After the grown Au NRs were separated from the growth solution by centrifugation (12000 rpm for 5 min) twice and redispersed in 20mL of deionized water, there was a certain loss of Au. The extinction spectrum of the 200 μ L of concentrated Au NRs is also shown in new Fig. S1 after diluted 15 times. Thus the loading amount of Au on Ni foam is $0.5\text{mM} \cdot 100\text{mL} \cdot (200\mu\text{L}/20\text{mL}) \cdot (0.26/0.33) = 0.39 \mu\text{mol}$.

Width/nm	Length/nm	Aspect ratio	LSPR/nm
15.12 \pm 1.55	43.11 \pm 3.47	2.9 \pm 0.3	700

Table. S1. Measured dimensions of the obtained Au NRs in Fig 1 (more than 100 Au NRs were measured).

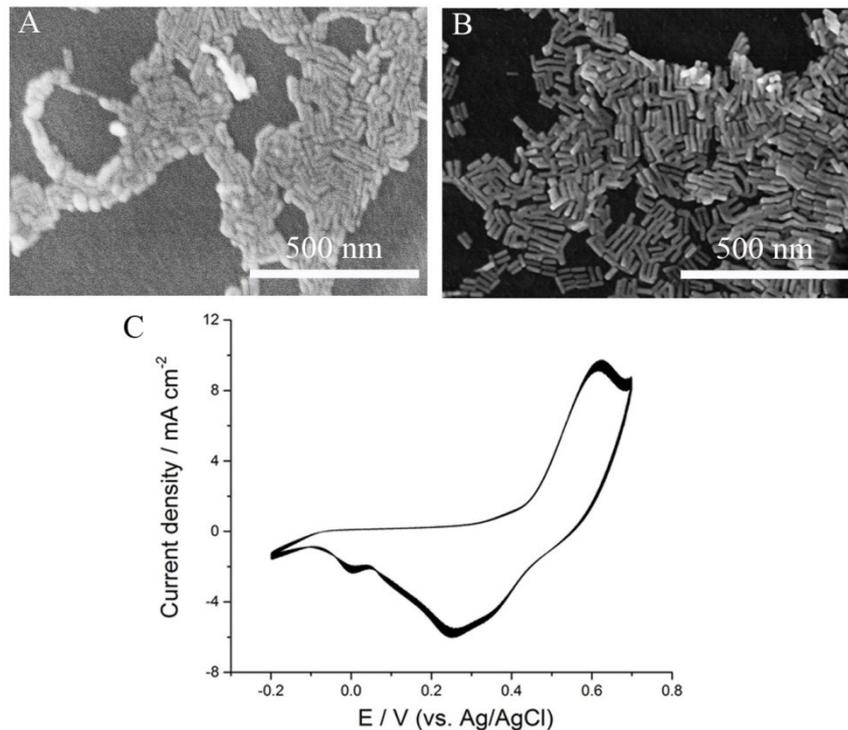


Fig. S2. SEM images of the same Au NRs/Ni foam electrode (A) newly prepared and (B) after at least successive 150CV scans in 0.1 M KOH solution; (C) Successive 150 CV scans of the Au NRs/Ni foam electrode in 0.1 M KOH solution at a scan rate of 100 mV/s in the absence of glucose.

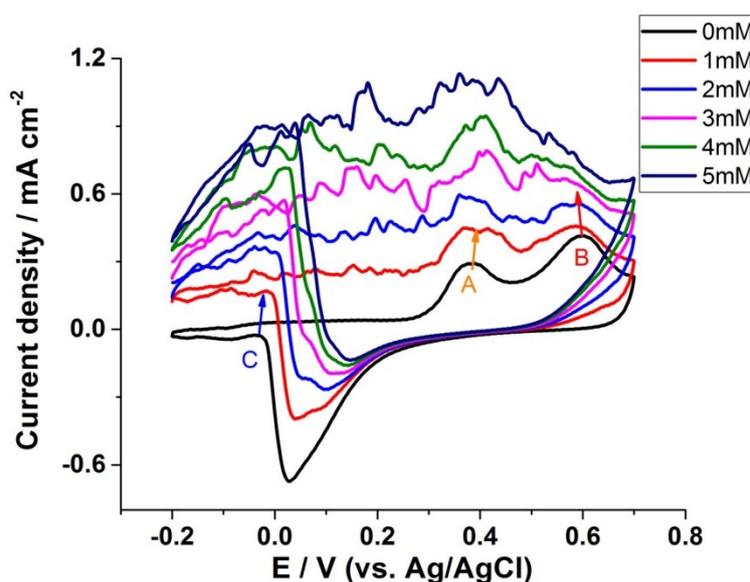


Fig. S3. CV curves of Au NRs/GCE in a series of glucose concentration measured in 0.1M KOH at a scan rate of 100 mV/s.

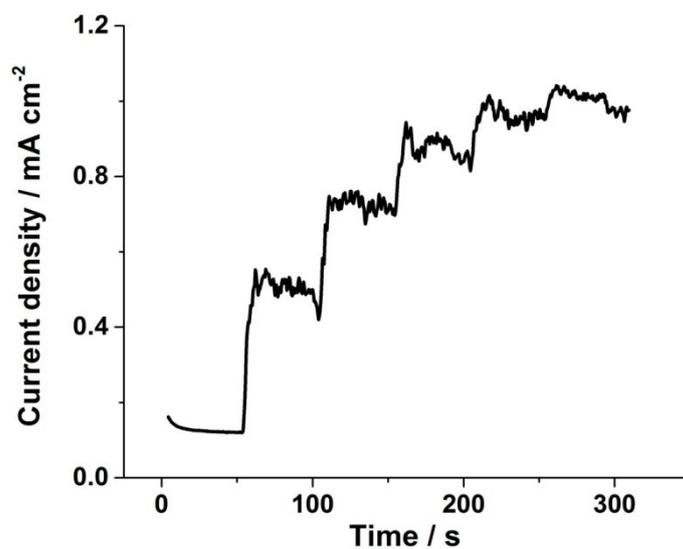


Fig. S4. Amperometric response curves of Au NRs/GCE upon successive addition of glucose (1 mM at a time) at 0.6 V (vs. Ag/AgCl).

Electrode composition	Au nanowire array	Nanoporous Pt	Porous Ni	Ni(OH) ₂ /3DGF	Cu(OH) ₂ /PGF
Sensitivity (mA mM ⁻¹ cm ⁻²)	0.309 (Ref.4)	0.642 (Ref.5)	2.9 (Ref.6)	2.65 (Ref.7)	3.36 (Ref.8)

Table. S2. The comparison of NEG sensing sensitivities based on various electrodes which reported previously. 3DGF: Three-dimensional graphene foam, PGF: Porous graphene foam.

References

- (1) K. Park, L.F. Drummy, R.C. Wadams, H. Koerner, D. Nepal, L. Fabris, R.A. Vaia, Growth Mechanism of Gold Nanorods, *Chem. Mater.* 2013, 25, 555–563.
- (2) J.A. Edgar, A.M. McDonagh, M.B. Cortie, Formation of Gold Nanorods by a Stochastic “Popcorn” Mechanism, *ACS Nano* 2012, 6, 1116–1125.
- (3) B. Rodríguez-González, F. Attouchi, M.F. Cardinal, V. Myroshnychenko, O. Stéphan, F.J. García de Abajo, L.M. Liz-Marzán, M. Kociak, Surface Plasmon Mapping of Dumbbell-Shaped Gold Nanorods: The Effect of Silver Coating, *Langmuir* 2012, 28, 9063–9070.
- (4) S. Cherevko, C.H. Chung, Gold nanowire array electrode for non-enzymatic voltammetric and amperometric glucose detection, *Sensors Actuators B Chem.* 2009, 142, 216–223.
- (5) J.F. Huang, 3-D nanoporous Pt electrode prepared by a 2-D UPD monolayer process, *Electroanalysis* 2008, 20, 2229–2234.
- (6) X. Niu, M. Lan, H. Zhao, C. Chen, Highly sensitive and selective nonenzymatic detection of glucose using three-dimensional porous nickel nanostructures, *Anal. Chem.* 2013, 85, 3561–3569.

(7) B. Zhan, C. Liu, H. Chen, H. Shi, L. Wang, Free-standing electrochemical electrode based on Ni(OH)₂/3D graphene foam for nonenzymatic glucose detection, *Nanoscale* 2014, 6, 7424-7429.

(8) I. Shackery, U. Patil, A. Pezeshki, N.M. Shinde, S. Kang, Copper Hydroxide Nanorods Decorated Porous Graphene Foam Electrodes for Non-enzymatic Glucose Sensing, *Electrochimica Acta* 2016, 191, 954–961.