Supporting Information

A Non-enzymatic nanoceria electrode for non-invasive glucose monitoring

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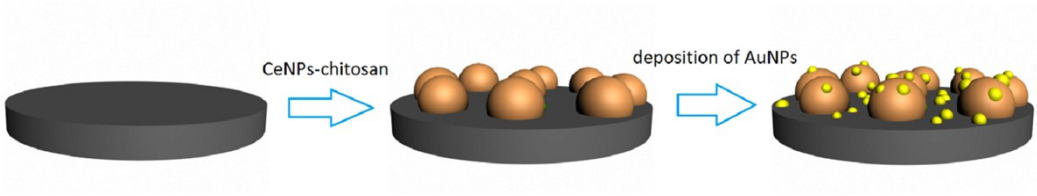

Figure S1. The fabrication procedure of AuNPs/CeO_2-CTS/GCE

XRD and XPS analysis of CeO_2

The XRD pattern of CeO_2, corresponding to JCPDS (34-0394), shows the peaks at 25.58, 33.13, 47.52, 56.39, 59.13, and 69.44° 2ϑ, which were assigned to the CeO_2 (111), (200), (220), (311), (222), (400), and (311) planes, respectively (Fig. S2a), which were indexed to the well crystalline face centered cubic structure of CeO_2. Its morphology was also characterized by TEM (JEOL 1300) that further confirmed its crystalline cubic structure (insert).

Qualitative and quantitative analysis of Ce^{3+} content in commercial nanoceria samples were studied by X-ray photoelectron spectroscopy (XPS)(Fig. S2b). Data was fitted by using the software XPSPEAK41, and the notation of Burroughs[1]. According to the notation, u_0, u, u', u'', u''' were labeled to the peaks belonging to the Ce $3d_{5/2}$ band, and v_0, v, v', v'', v''' were labeled to the peaks belonging to the Ce $3d_{3/2}$ band. Therefore, the XPS investigation indicated that Ce^{3+} and Ce^{4+} species can be differentiated with distinct line shapes corresponding to various states: $Ce^{3+}=u_0+u+v_0+v''$, while $Ce^{4+}=v+v''+v'''+u+u''+u'''$, so Ce^{3+} atomic fraction can be obtained through the ratio of the integrated peak areas from the follow equation:

$$[Ce^{3+}]=\frac{u_0+u'+v_0+v'}{u_0+u+u'+u''+u'''+v_0+v+v'+v''+v'''}$$

In this equation, at the highest binding energy peak u''' and v''' are located at 916.9 and 898.3 eV respectively. They are the result of a multiples (v and u) corresponding to the spin-orbit split $3d_{5/2}$ and $3d_{3/2}$ core holes. Another binding energy peak, v'' is located at 898.0 eV, and u'' at about 907 eV is present in the higher energy of Ce $3d_{3/2}$ peak. Besides, u' and v' are located at 903.4 and 885.2 eV respectively are due to the Ce $3d^9 4f^1$ O $2p^6$ final state. While the lowest binding energy state u_0 and v_0 are at 899.1 and 880.9 eV respectively that are because of Ce $3d^9 4f^2$ O $2p^5$ state[2]. The obtained data was input into XPSPEAK41 software, after the fitting, its Ce^{3+} atomic fraction can be calculated to be about 34%, which indicates the good electron-transfer ability of CeO_2 during the oxidation of glucose by AuNPs.

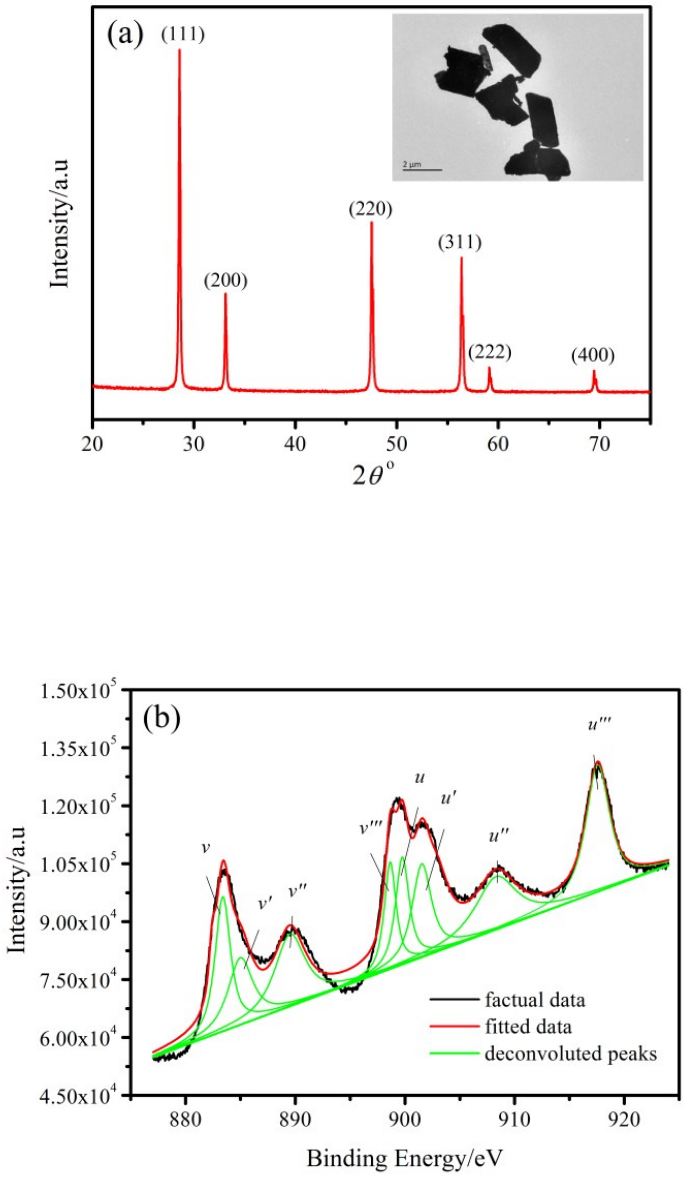

Figure S2. (a) XRD patterns of CeO_2. (Inset: TEM image of CeO_2 nanoparticles); (b) Ce3d XPS of CeO_2 NPs.

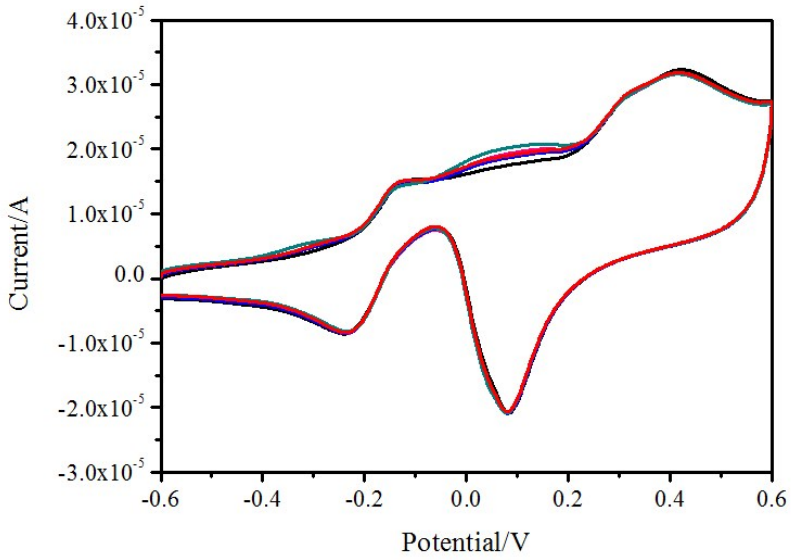

Figure 3S. The reproducibility of the signal in the solution contains 3.0 mM glucose. The CV was repeated for 5 times.

Reference

[1] Burroughs P, Hamnett A, Orchard A F, et al. *Journal of the Chemical Society, Dalton Transactions*, **1976** (17): 1686-1698.

[2] Bêche E, Charvin P, Perarnau D, et al. *Surface and Interface Analysis*, **2008**, 40(3-4): 264-267.