Supporting Information

Enhancing the Performance of Photoelectrochemical Glucose Sensor via the Electron Cloud Bridge of Au in $SrTiO_3$/PDA Electrodes

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Glucose oxidase (GOx) is specific catalysis for glucose, so the electrode can only work in the presence of glucose. Then, the performance toward selectivity of photoelectrochemistry (PEC) electrode is well-defined. The catalytic process of GOx and the photocurrent response can be described as follows [1]:

$$GOx\ (FAD) + glucose \rightarrow GOx\ (FADH_2) + glucose\ acid$$

$$GOx\ (FADH_2) + O_2 \rightarrow GOx\ (FAD) + H_2O_2$$

$$SrTiO_3/Au/PDA \xrightarrow{h\nu} SrTiO_3/Au/PDA + e^- + h^+$$

$$2h^+ + H_2O_2 \rightarrow O_2 + 2H^+ \text{ (anode)}$$

$$2e^- + 2H^+ + H_2O_2 \rightarrow 2H_2O \text{ (cathode)}$$

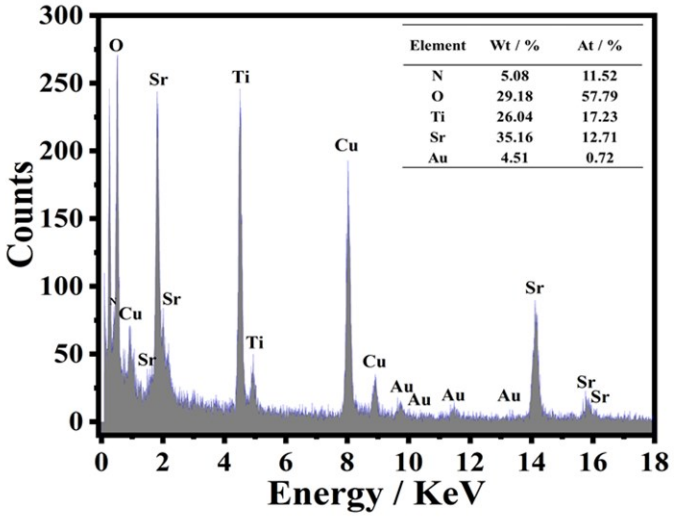

Fig. S1. EDX spectrum of the 3D hollowed out $SrTiO_3$/Au/PDA nanoarray.

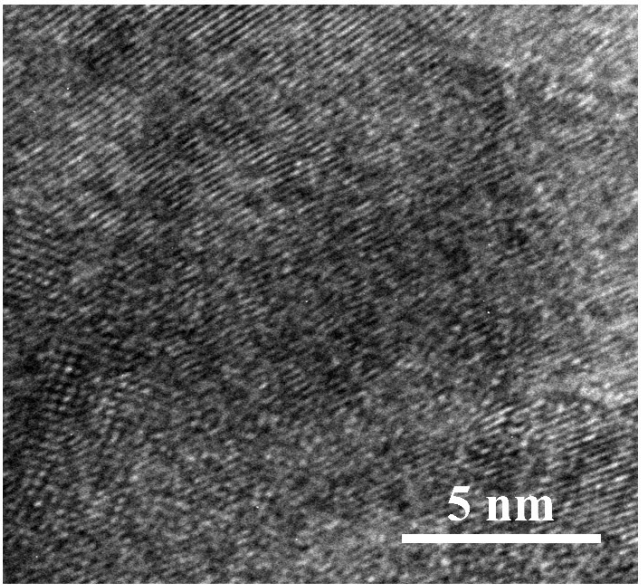

Fig. S2. HERTEM image of the 3D hollowed out $SrTiO_3$/PDA nanoarray.

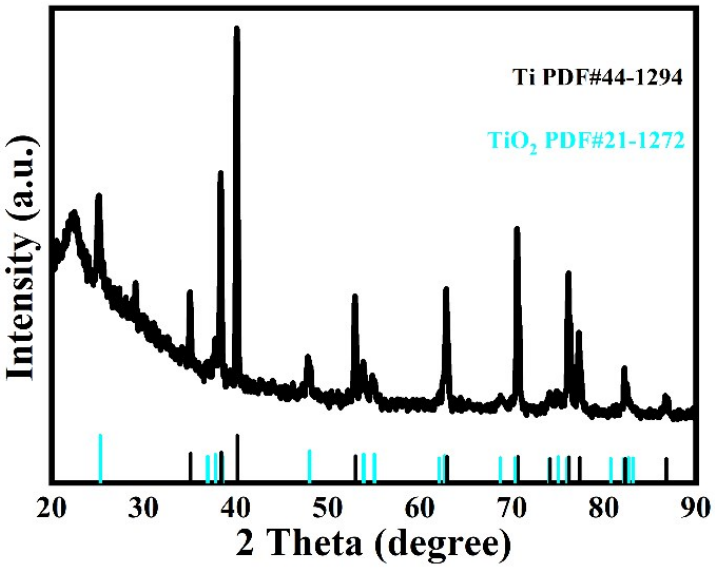

Fig. S3. XRD pattern of the precursor 3D hollowed out TiO_2.

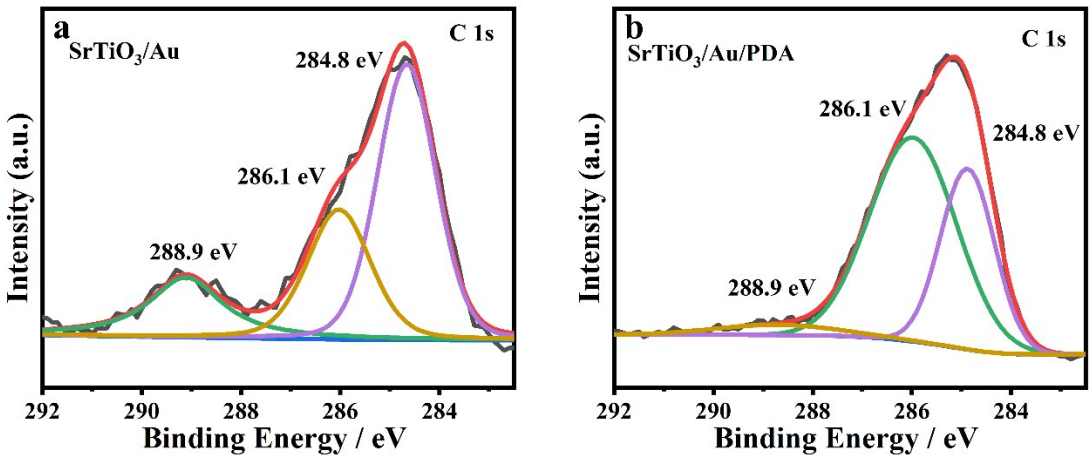

Fig. S4. The high-resolution spectra of C1s: (a) $SrTiO_3$/Au; (b) $SrTiO_3$/Au/PDA.

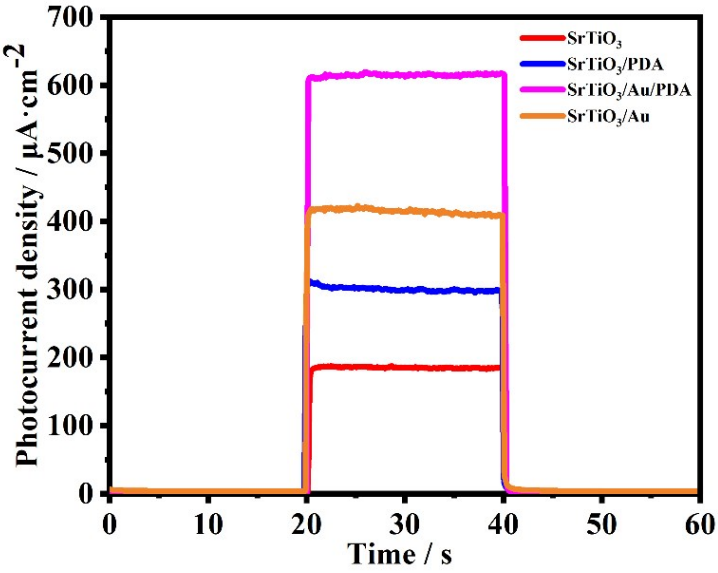

Fig. S5. Photocurrent response.

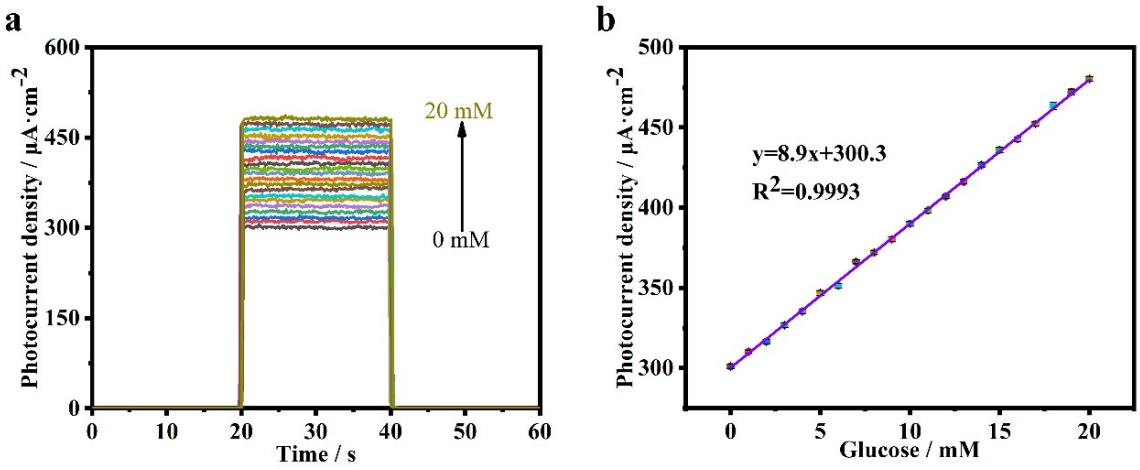

Fig. S6. The 3D hollowed out $SrTiO_3$/PDA/GOx PEC sensor. (a) Photocurrent responses at different glucose concentrations (0–20 mM) in 0.1 M PBS (pH = 7.4). (b) Calibration curve of glucose concentration and photocurrent density.

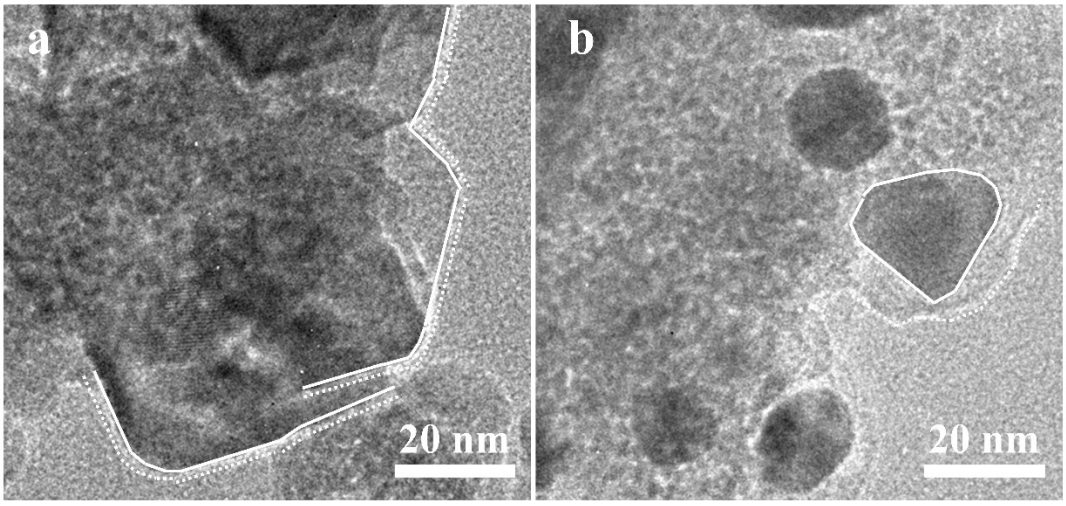

Fig. S7. (a) TEM of $SrTiO_3$/Au/PDA. (b) TEM of $SrTiO_3$/Au/PDA (excess PDA).

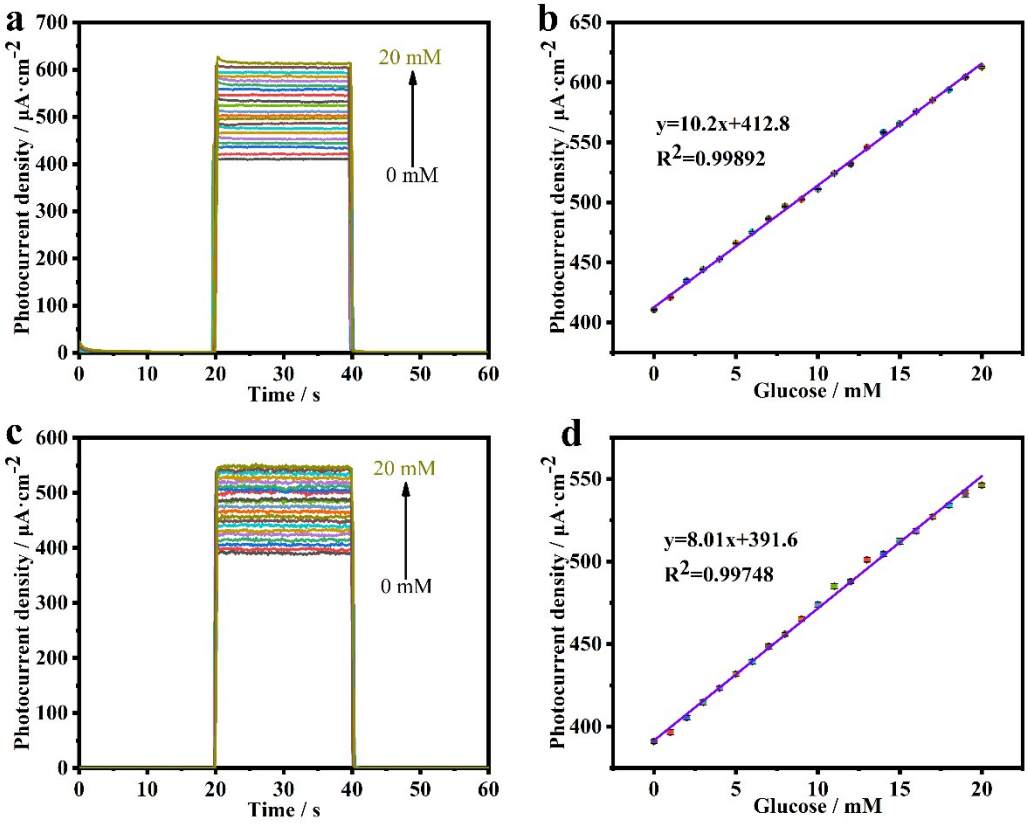

Fig. S8. The 3D hollowed out $SrTiO_3$/Au/GOx PEC sensor. (a) Photocurrent responses at different glucose concentrations (0–20 mM) in 0.1 M PBS (pH = 7.4). (b) Calibration curve of glucose concentration and photocurrent density. The 3D hollowed out $SrTiO_3$/Au/PDA (excess PDA)/GOx PEC sensor. (c) Photocurrent responses at different glucose concentrations (0–20 mM) in 0.1 M PBS (pH = 7.4). (d) Calibration curve of glucose concentration and photocurrent density.

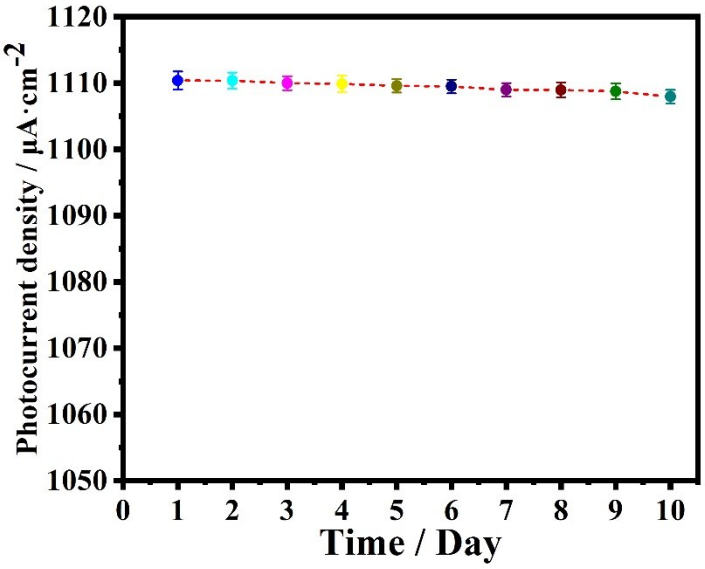

Fig. S9. Long-term (10 days) stability test of the hollowed out $SrTiO_3$/Au/PDA/GOx PEC sensor in 0.1 M PBS (pH = 7.4) (presence of 20 mM glucose).

Table S1. The surface chemical states of C element and corresponding percentages in the samples.

Peak	C-O or C-N (%)
$SrTiO_3$/Au	28.57
$SrTiO_3$/Au/PDA	62.60

Table S2. Determination of glucose concentration in human serum samples (n = 5).

Sample	Known/mM	Discovered/mM	Added glucose/mM	Total discovered/mM	RSD/%	Recovery/%
1	0.840	0.851	0.500	1.351	3.200	100.831
2	6.080	6.133	0.500	6.633	3.100	100.805
3	7.410	7.396	0.500	7.896	2.900	99.823
4	11.370	11.190	0.500	11.690	3.100	98.487
5	16.940	16.679	0.500	17.179	3.200	98.507

References

[1] B.D. Yan, X.R. Zhao, D.L. Chen, Y. Cao, C.Z. Lv, J.C. Tu, X.H. Wang, Q. Wu, Enhanced photoelectrochemical biosensing performance for Au nanoparticle-polyaniline-TiO_2 heterojunction composites, RSC Adv. 10(72) (2020) 43985-43993.