

Supporting Information For

**Double Cabin Galvanic Cell Synthesizing Nanoporous Flower-like
Pb-containing Pd-Au Nanoparticles for Nonenzymatic Formaldehyde
Sensor**

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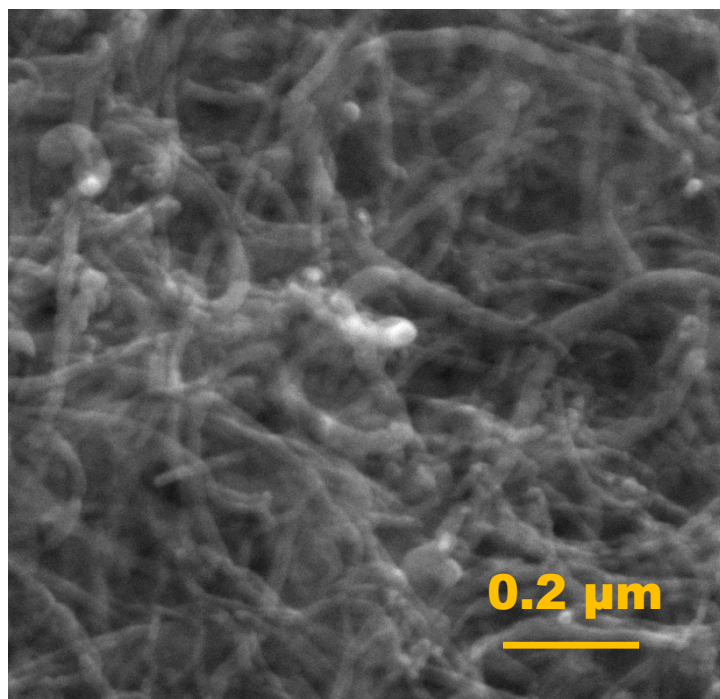


Figure S1. SEM images of MWCNTs/GCE.

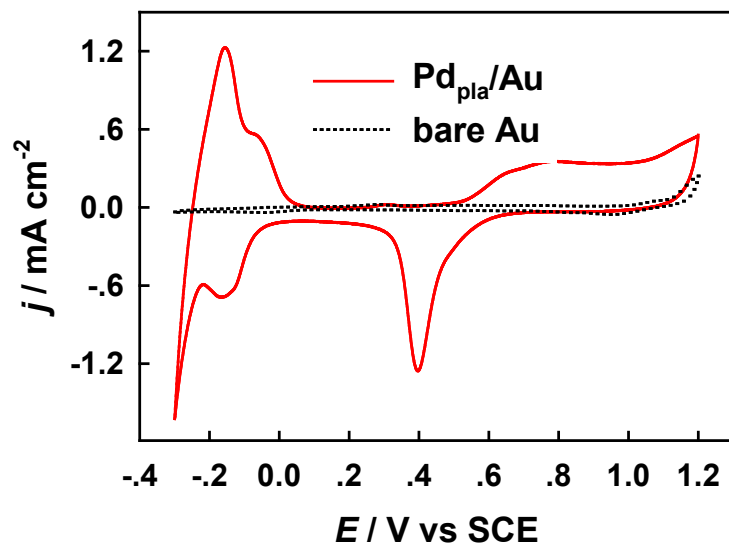


Figure S2. CV curves at $\text{Pd}_{\text{pla}}/\text{Au}$ and bare Au electrodes in 0.1 M H_2SO_4 aqueous solution. Scan rate: 50 mV s^{-1} . $\text{Pd}_{\text{pla}}/\text{Au}$ electrode was fabricated by electroplating Pd at 0 V vs SCE on a QCM Au electrode in 3.0 mM PdCl_2 + 0.1 M HClO_4 aqueous solution for 240 s. Here, the reduction peak of Au oxides at ca. 0.85 V disappeared after electroplating Pd on the Au surface, and the big reduction peak of Pd oxides (plus dissolved oxygen) appeared at ca. 0.4 V, indicating that the electrodeposited Pd atoms have fully covered the substrate Au sites. The peaks of hydrogen adsorption/desorption on deposited Pd appeared at ca. $0 \sim -0.22$ V.

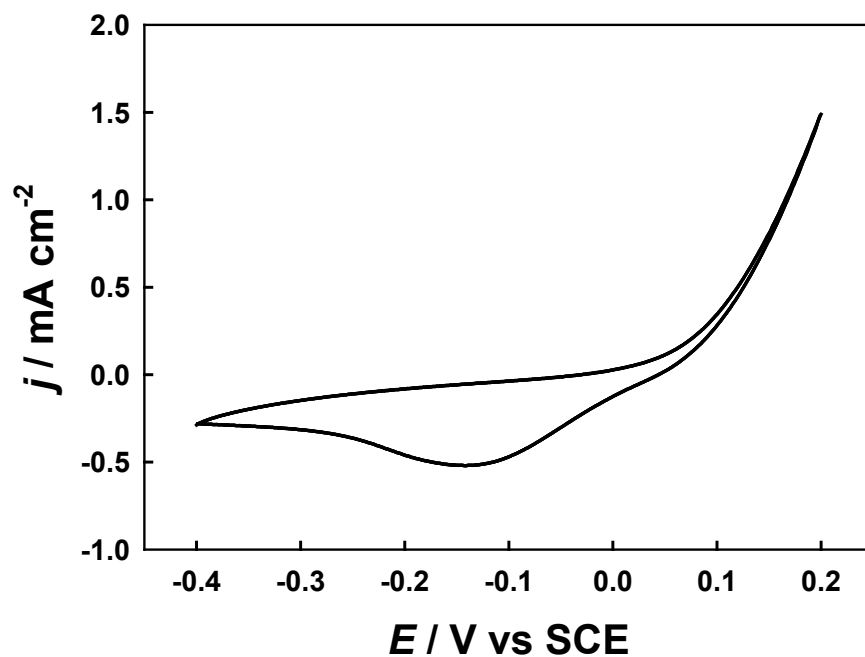


Figure S3. CV curves at Cu plate in 0.1 M HClO₄ aqueous solution. Scan rate: 50 mV s⁻¹.

Here, during the forward scan, the electrochemical dissolving of bulk Cu occurred from ca. 0.01 V, and the current increased dramatically at more positive potential. During the backward scan, the reduction peak appeared at ca. -0.15 V, corresponding to the reduction of Cu²⁺ to bulk Cu.

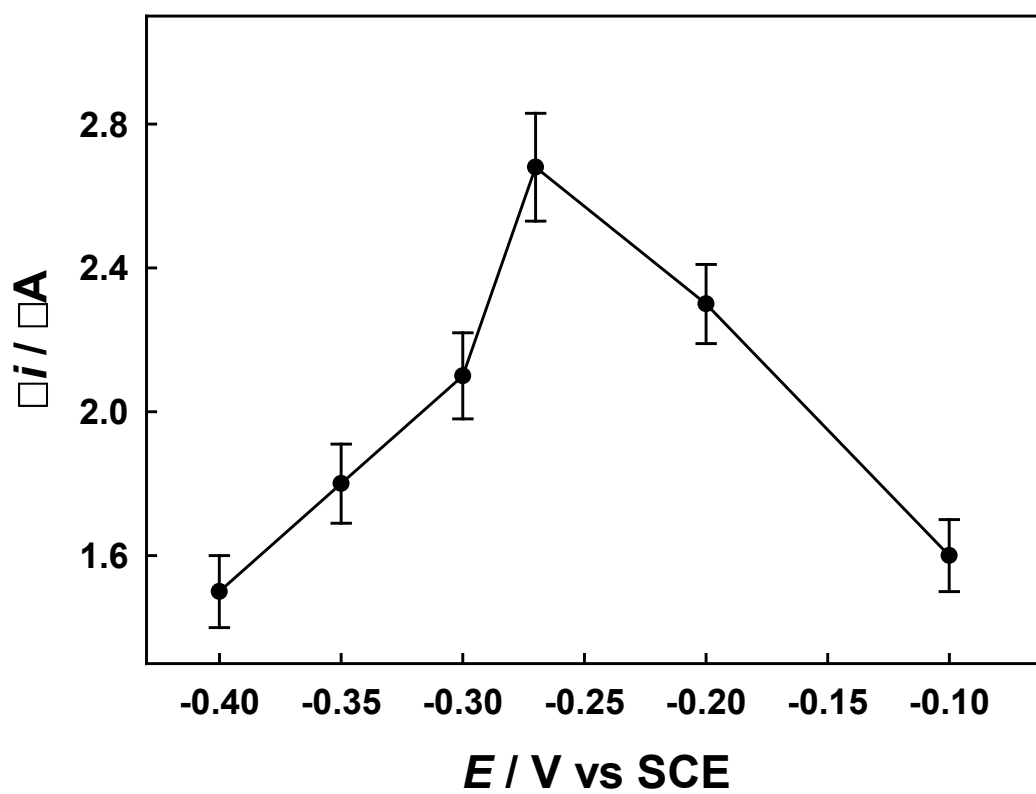


Figure S4. Effects of the applied potential on the amperometric response of 50 μM HCHO for Pb-Pd₃Au₁/MWCNTs/GCE in 0.1 M KOH aqueous solution.

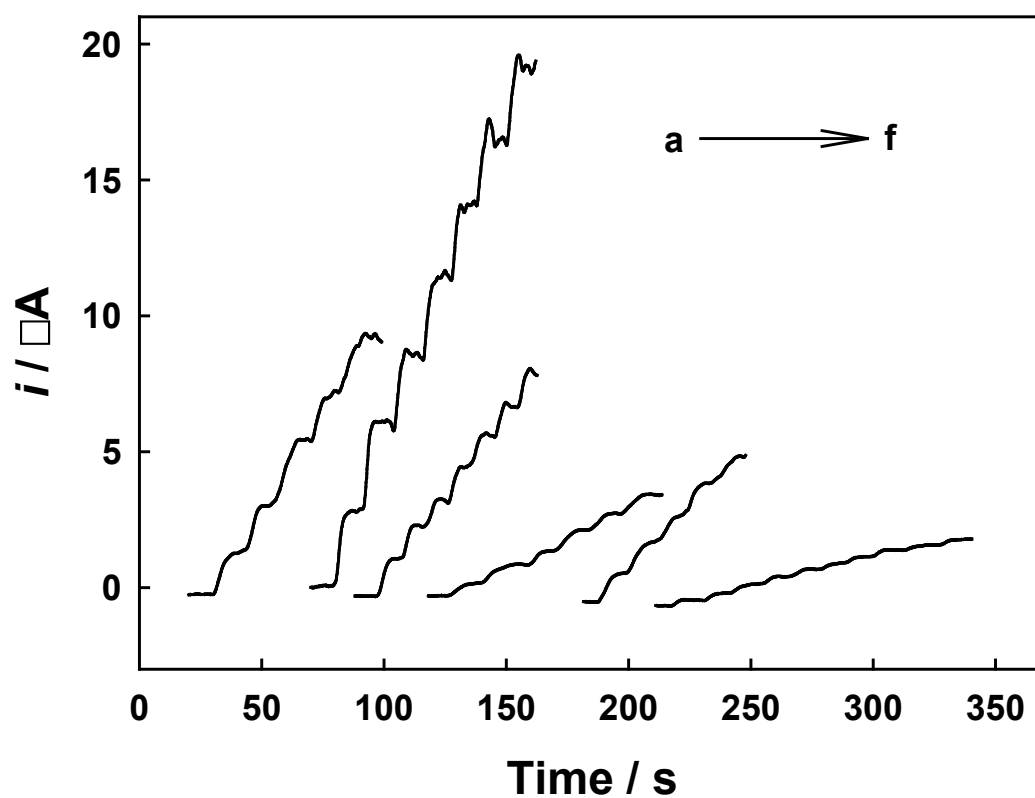


Figure S5. Amperometric response to HCHO at Pb-Pd₃Au_{0.5}/MWCNTs/GCE (a), Pb-Pd₃Au₁/MWCNTs/GCE (b), Pb-Pd₃Au₃/MWCNTs/GCE (c), Pb-Pd₃Au₅/MWCNTs/GCE (d), Pd₃Au₁/MWCNTs/GCE (e), Pb-Pd/MWCNTs/GCE (f) upon successive addition of 50 μM HCHO into the stirred 0.1 M KOH aqueous solution. Applied potential: -0.27 V .

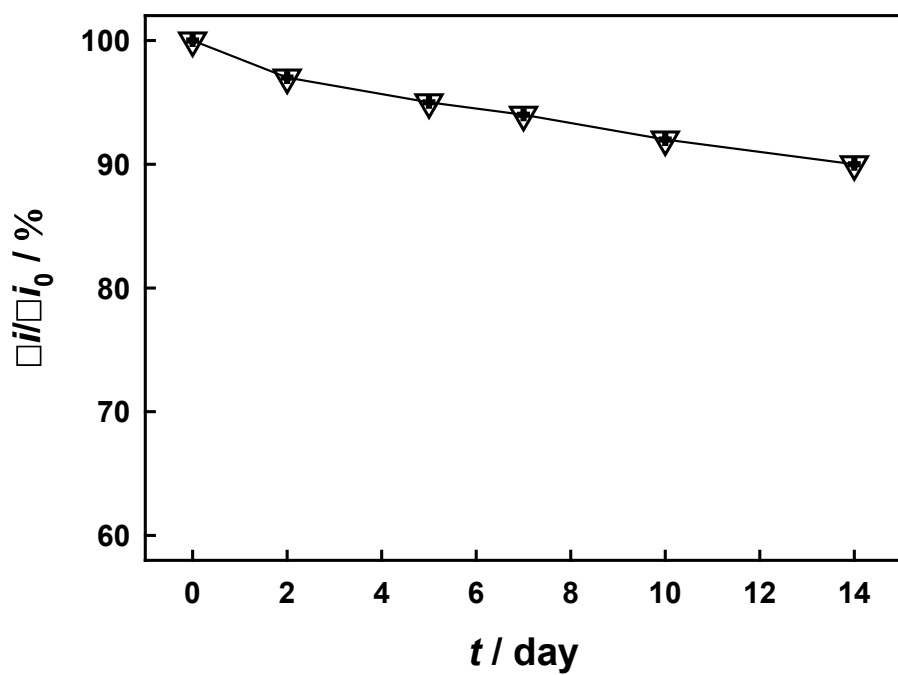


Figure S6. Long-term stability of Pb-Pd₃Au₁/MWCNTs/GCE with repeated detection of 50 μM formaldehyde by potentiostatic method for two weeks. Applied potential: -0.27 V

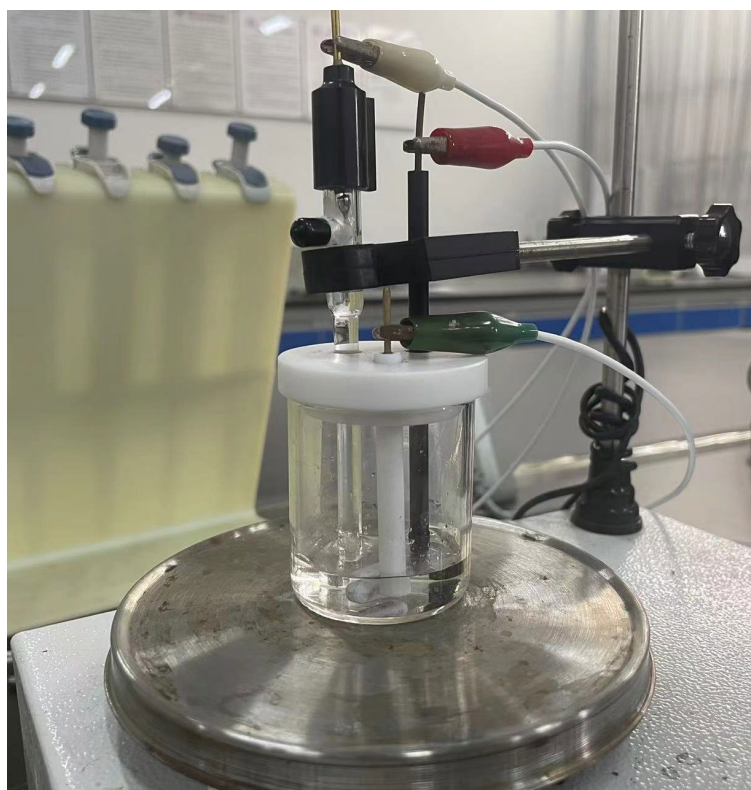


Figure S7. The physical picture display of the formaldehyde sensor with three-electrode system.