# Electronic Supplementary Information for

# Electrodeposition of Bright Gold – a Green Path Using Hypoxanthine as Complexing Agent

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## Cyclic voltammogram

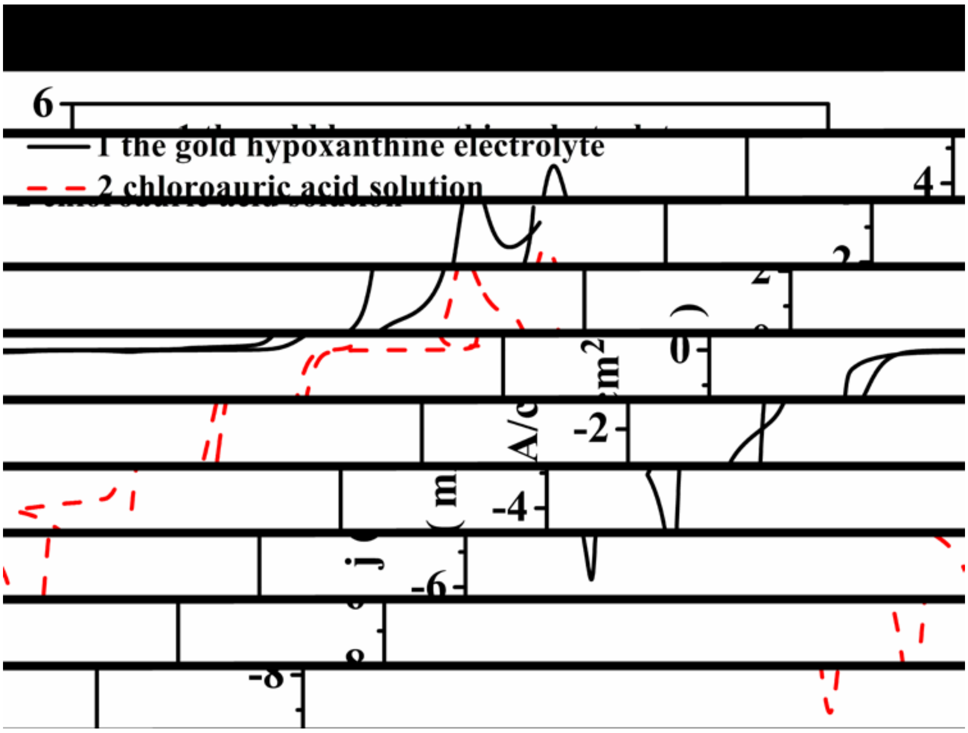

Fig. S1. Cyclic voltammogram for different electrolyte on GCE at 20 mV/s. (1) the gold hypoxanthine electrolyte contain 0.03 M $HAuCl_4$ + 0.18 M hypoxanthine + 1.0 M KOH, (2) chloroauric acid solution contain 0.03 M $HAuCl_4$ + 0.5 M $H_2SO_4$

## Electroplating gold from hypoxanthine bath:

As can seen in Fig. S2, there is no significantly difference with higher hypoxanthine concentration. Therefore, although, the hypoxanthine can be oxidized in the anodic potential at the counter electrode, in the industrial application, when the gold is used at the counter electrode, the dissolution of Au electrode at 0.42 V(less positive than the oxidation of hypoxanthine), will be predominant over the oxidation of the hypoxanthine to compromise the reduction current at the working electrode. The concentration of hypoxanthine (0.18 M) is excessive to coordinate the Au(III). And we also found that, there is almost no difference when the concentration is 0.3 M. So, in the real application, it seems very easy to solve the problem of hypoxanthine degradation by simply increasing the concentration even the oxidation of hypoxanthine does happen.

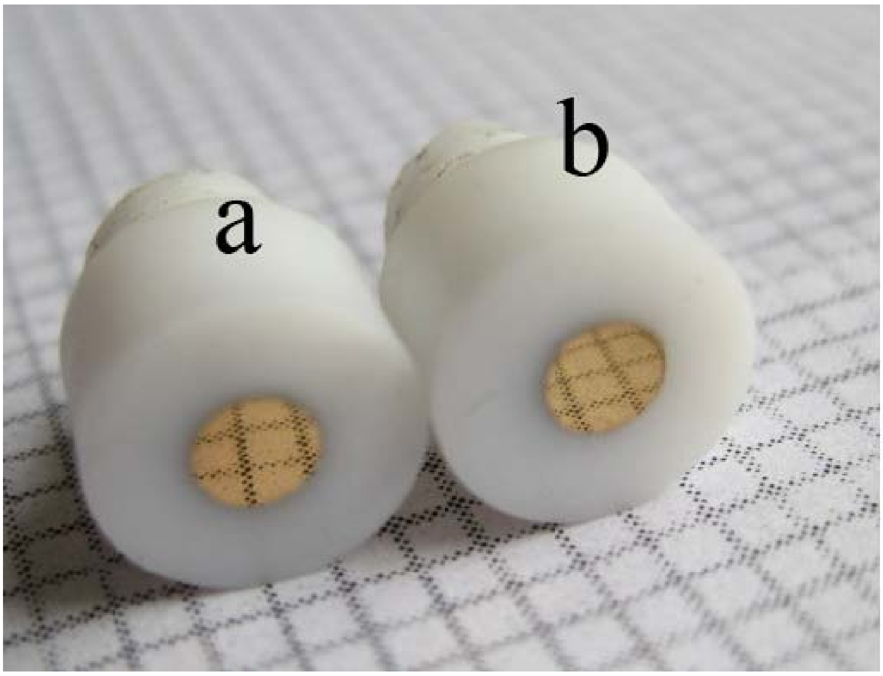

Fig. S2 The gold deposit obtained by hypoxanthine bath
(a) the gold bath contain 0.03 M $HAuCl_4$ + 0.18 M hypoxanthine + 1.0 M KOH + 10 mM SUNO + 60 ppm PEI-1800 (b) the gold bath contain 0.03 M $HAuCl_4$ + 0.3 M hypoxanthine + 1.0 M KOH + 10 mM SUNO + 60 ppm PEI-1800, current density 0.1A/$dm^2$, 10min

**SEM（lower magnification）：**Fig. S3 illustrates the surface morphology of the gold coating with the lower magnification. a bright and compact gold deposit can be obtained in the present of PEI-1800.

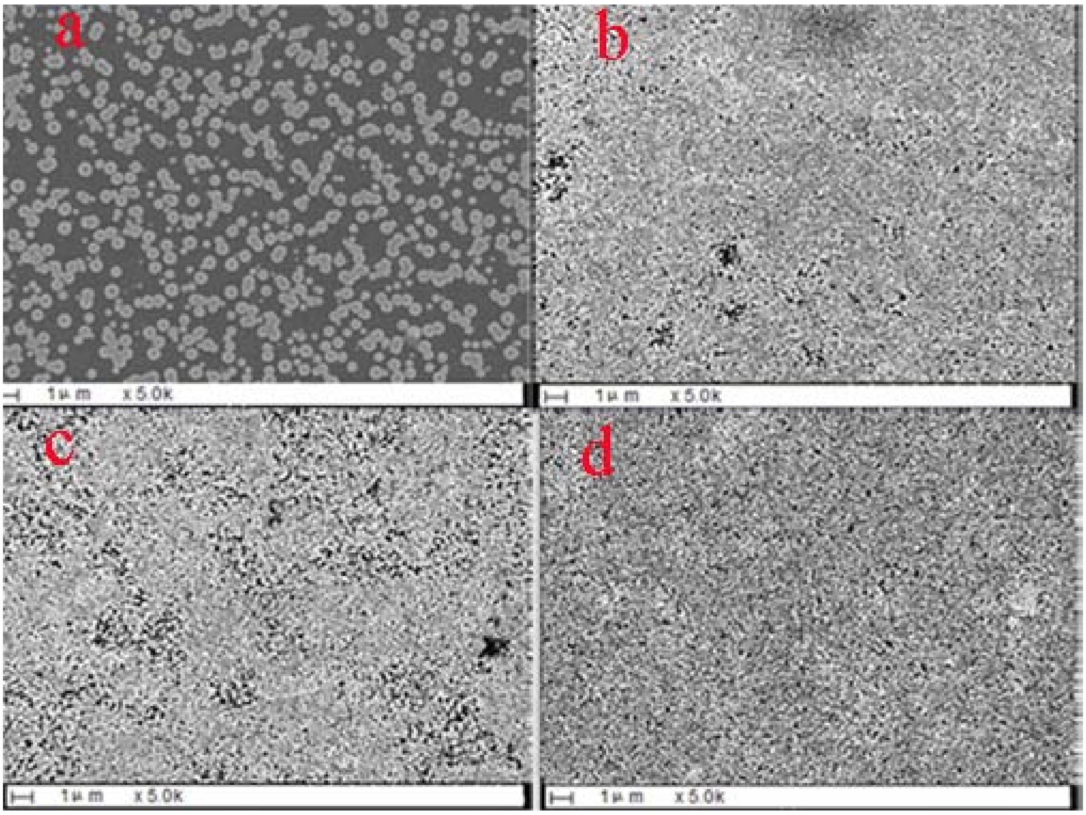

Fig. S3 SEM images (lower magnification) of the top views of gold deposits obtained from (a) the gold hypoxanthine electrolyte + 10 mM SUNO, with the addiction of (b) 60 ppm PEI-1800, (c) 240 ppm PEI-1800, (d) 1000 ppm PEI-1800.

## Electroplating gold from different bath:

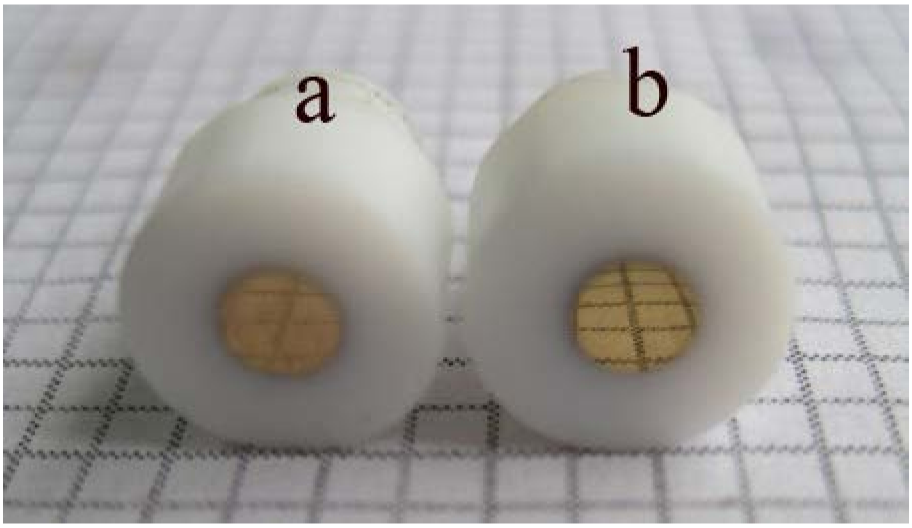

Fig. S4 The gold deposit obtained by different bath
(a) obtained by a bath containing cyanide (offered by Daming electroplating company from Guandong province, current density 0.5A/dm$^2$, 1 min ); (b) obtained by gold hypoxanthine electrolyte (current density 0.1A/dm$^2$, 10min )

**Electrochemical cell:** Fig. S5 shows the construction of electrochemical cell. A disk glassy carbon electrode (GCE, φ3 mm), a platinum disk (Pt, φ500 μm)  or nickel electrode (Ni, φ3 mm) was used as the working electrode. Pt slice (1cm × 1cm) was used as the counter electrode which was paralleled to working electrode, and $Hg/Hg_2Cl_2$ was used as a reference electrode. All potentials were referred to this reference electrode unless noted. The working electrodes were polished with different dimension alumina slurries (1.0, 0.3, 0.05 μm) subsequently and cleaned with ultrapure water.

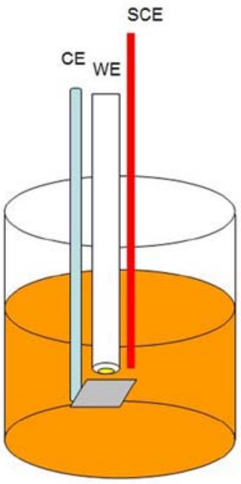

Fig. S5 The construction of electrochemical cell