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Supporting Information

Bimetallic Au@Pt@Au core-shell nanoparticles on graphene oxide nanosheets for high-performance H_2O_2 bi-directional sensing

Xiao-Rong Li,[ab] Ming-Chen Xu,[a] Hong-Yuan Chen[a] and Jing-Juan Xu*[a]

[a] *State Key Laboratory of Analytical Chemistry for Life Science and Collaborative Innovation Center of Chemistry for Life Sciences, School of Chemistry and Chemical Engineering, Nanjing University, Nanjing 210093, P. R. China*

[b] *Jiangsu Key Laboratory for Chemistry of Low-Dimensional Materials, School of Chemistry & Chemical Engineering, Huaiyin Normal University, Huaian 223300, P. R. China*

** To whom correspondence should be addressed. Tel. / Tax: +86-25-83597294. E-mail: xujj@nju.edu.cn*

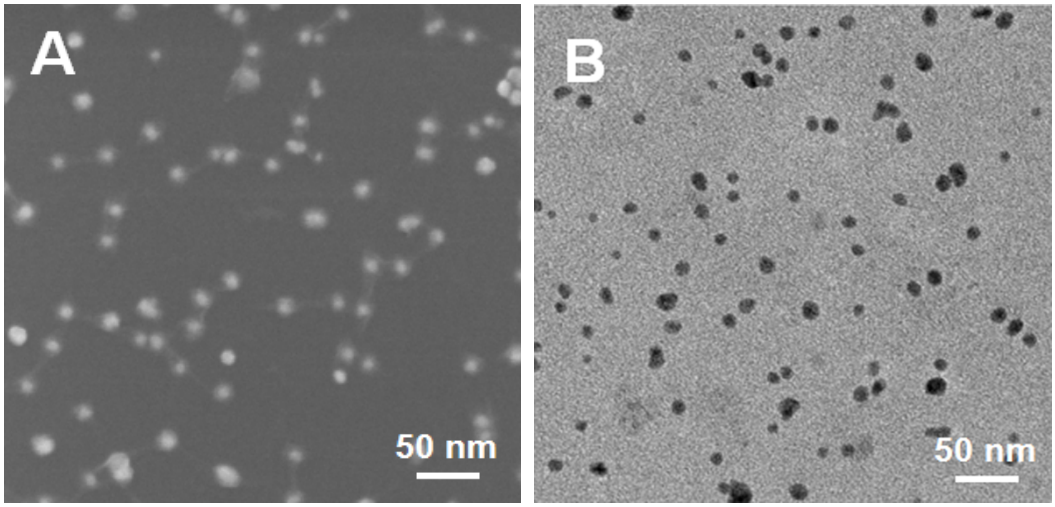


Fig. S1 SEM (A) and TEM (B) images of GO/Au nanocomposites.

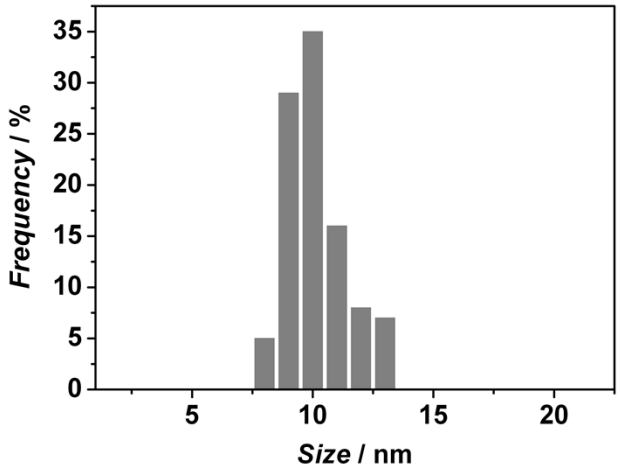
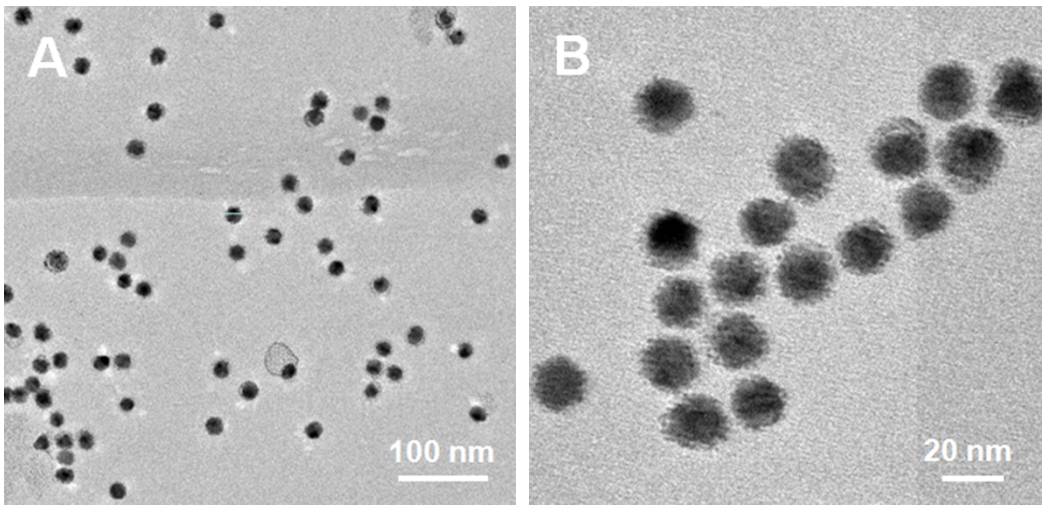


Fig. S2 Size-histogram of Au nanoparticles on GO nanosheets based on TEM measurement.

Synthesis of GO/Au@Pt@Au(s) nanocomposites

As a comparison, GO/Au@Pt@Au(s) nanocomposites consisting of the Au core, Pt inner layer and smooth Au outer shell (Fig. S3) were synthesized following an identical synthetic procedure except sodium citrate was removed in the last reaction step (that is, for the smooth Au outer shell growing step, only 100 μL of an aqueous 2.94×10^{-4} M $HAuCl_4$ was added to the GO/Au@Pt@Ag trilayer nanoparticles suspension).



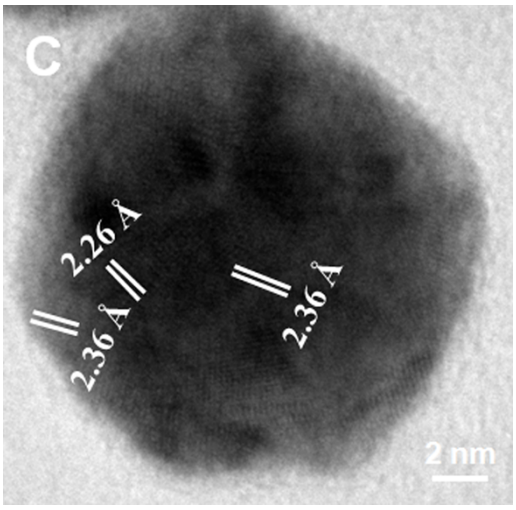


Fig. S3 (A-B) TEM images of GO/Au@Pt@Au(s) nanocomposites without sodium citrate in the last reaction step; (C) HR-TEM images of a single Au@Pt@Au(s) nanoparticle with a Au core, Pt inner layer and smooth Au outer shell on GO nanosheets.

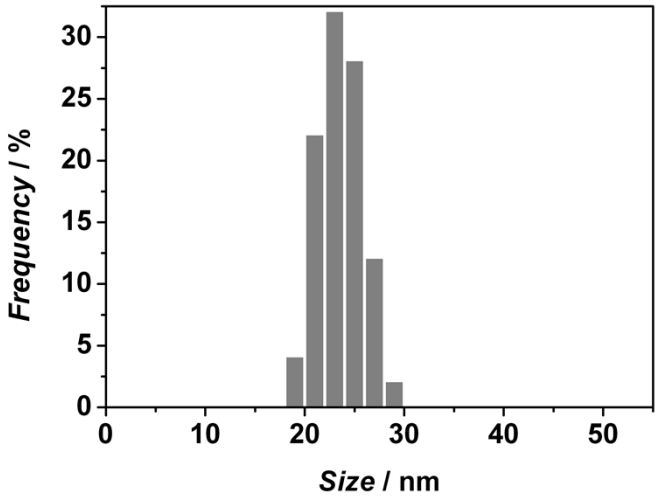


Fig. S4 Size-histogram of Au@Pt@Au nanoparticles on GO nanosheets based on TEM measurement.

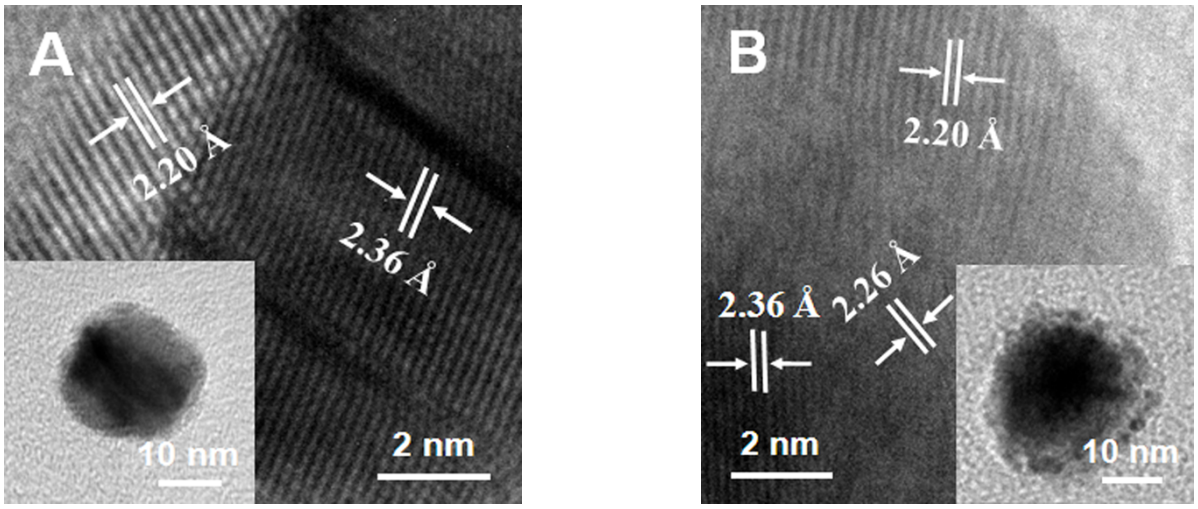


Fig. S5 HR-TEM images of a single Au@Ag (A) and a single Au@Pt@Ag (B) on GO nanosheets.

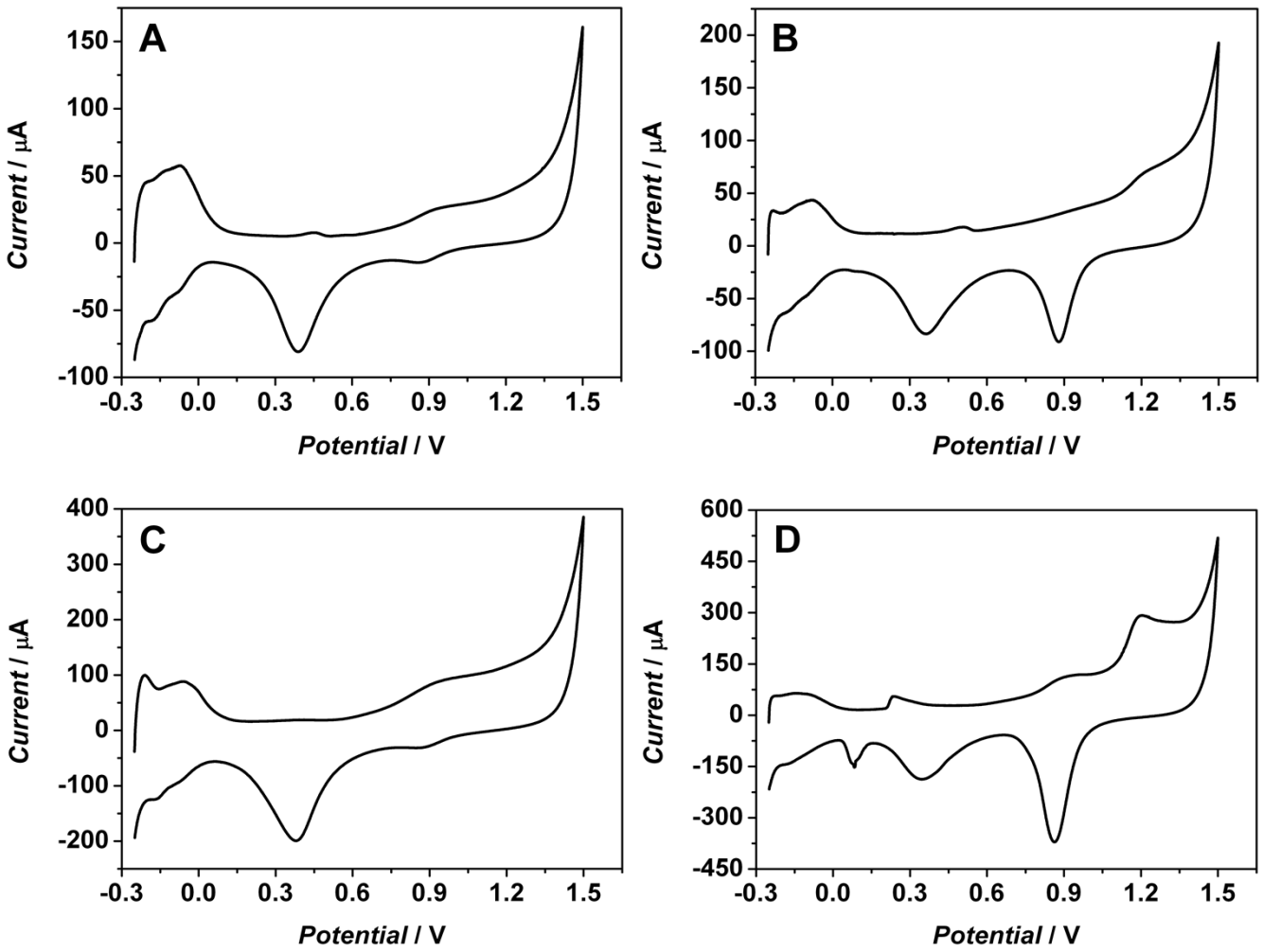


Fig. S6 Cyclic voltammograms of (A) Au@Pt, (B) Au@Pt@Au, (C) GO/Au@Pt and (D) GO/Au@Pt@Au catalysts in nitrogen-saturated 0.5 M H_2SO_4. Scan rate: 50 mV s^{-1}.

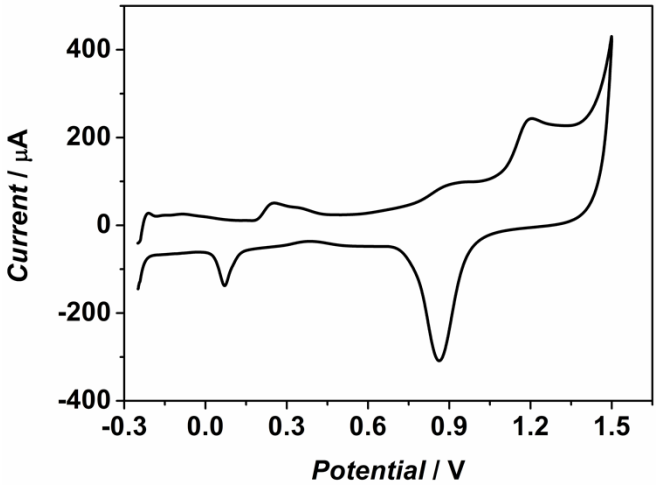


Fig. S7 Cyclic voltammograms of GO/Au@Pt@Au(s) catalysts with one exposed metal surface (Au) consisting of the

Au core, Pt inner layer and smooth Au outer shell on GO nanosheets in nitrogen-saturated 0.5 M H_2SO_4. Scan rate: 50 mV s^{-1}.

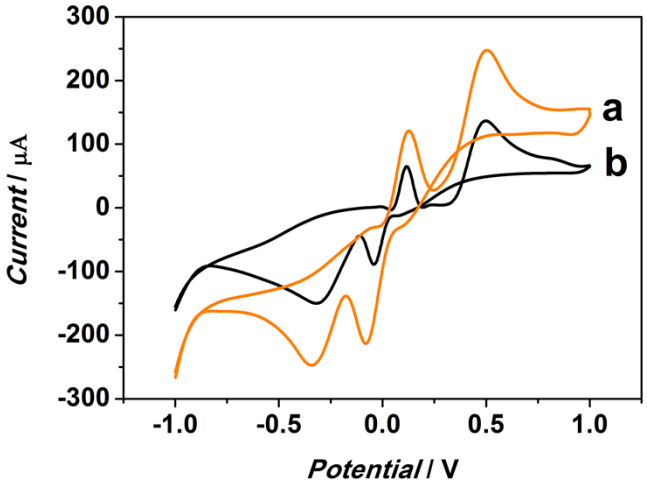


Fig. S8 Cyclic voltammograms of (a) GO/Au@Pt@Au-modified GCE with two exposed metal surfaces (Au and Pt) consisting of the Au core, Pt inner shell, and Au protuberances outer shell and (b) GO/Au@Pt@Au(s)-modified GCE with one exposed metal surface (Au) consisting of the Au core, Pt inner layer and smooth Au outer shell on GO nanosheets in nitrogen-saturated PBS (0.1 M pH 7.4) + 5 mM H_2O_2. Scan rate: 50 mV s^{-1}.