Supporting Information

Amine Oxide Surfactant-Mediated Synthesis of Plate-based Gold Nanocrystals with Tunable Surface Wrinkles and Their Applications in Ethylene Glycol Oxidation Reaction

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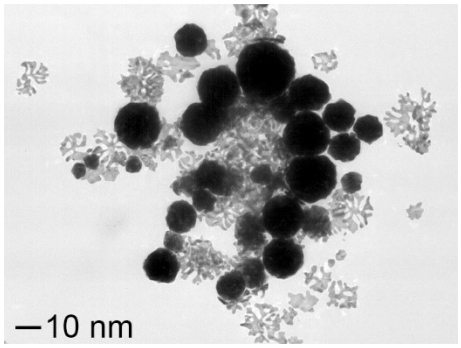

Figure S1. TEM image of Au nanocrystals obtained *via* the standard procedure, except that no OTAC was added.

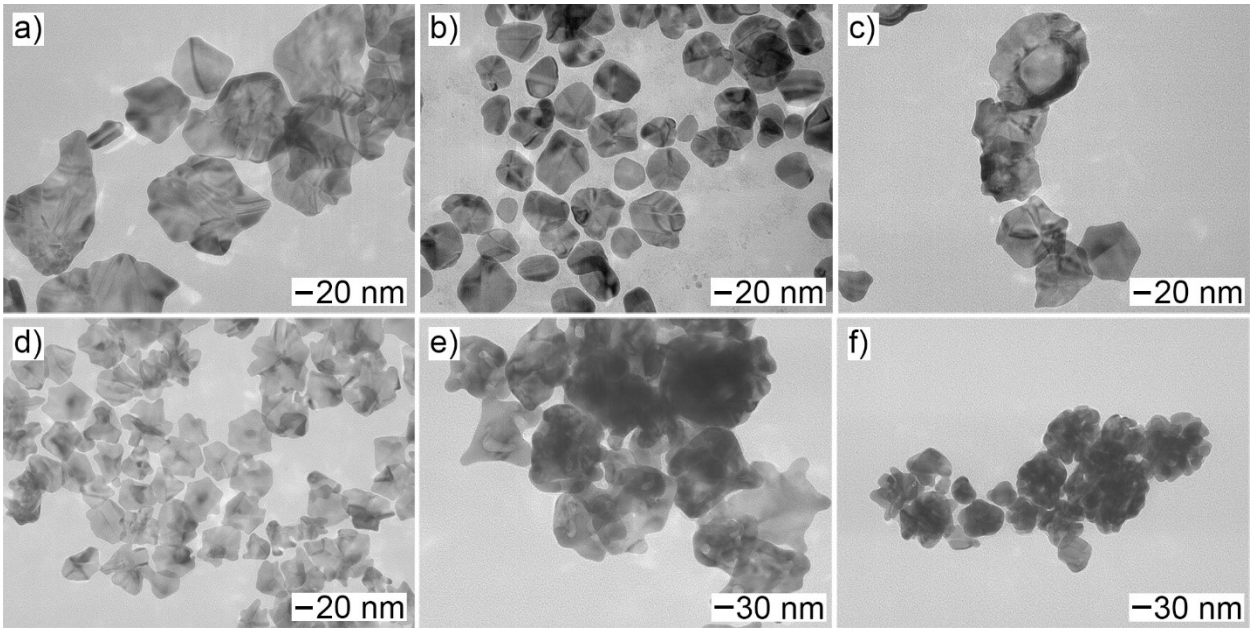

Figure S2. TEM images of Au nanocrystals obtained *via* the standard procedure, except that the LAO was replaced by LDAO (200 mM) with the volume set to a) 0.01 mL; b) 0.05 mL; c) 0.1 mL; d) 0.25 mL; e) 0.5 mL; f) 1 mL, respectively.

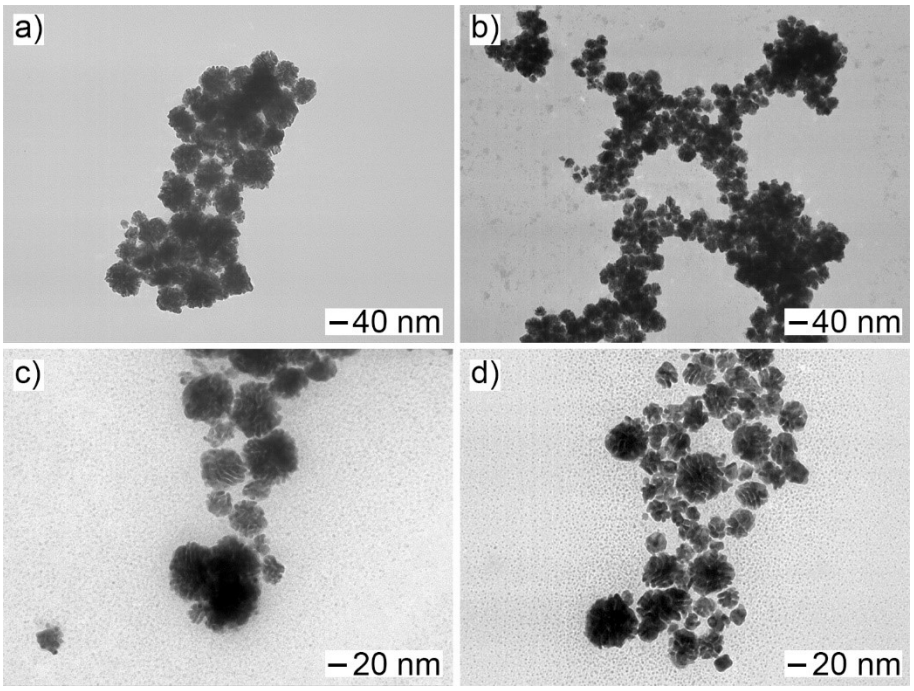

Figure S3. TEM image of Au nanocrystals obtained via the standard procedure, except that except that the LAO was replaced by LDAO (1.3 M) with the volume set to: a) 0.25 mL, b) 1 mL, c) 2 mL, and d) 5 mL, respectively.

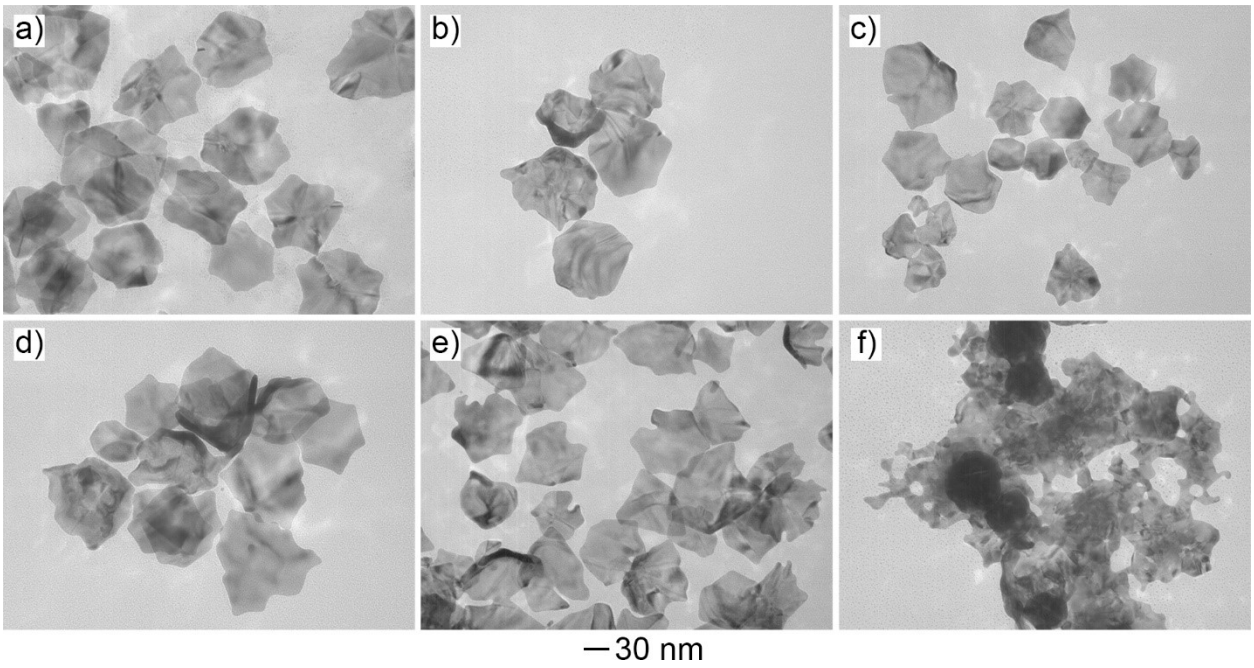

Figure S4. TEM images of Au nanocrystals obtained via the standard procedure, except that the LAO was replaced by $C_{12\text{-}18}$DAO as follows: a) 200 mM, 0.02 mL; b) 200 mM, 0.1 mL; c) 200 mM, 0.25 mL; d) 200 mM, 0.5 mL; e) 200 mM, 1 mL; f) 20%wt, 5 mL, respectively.

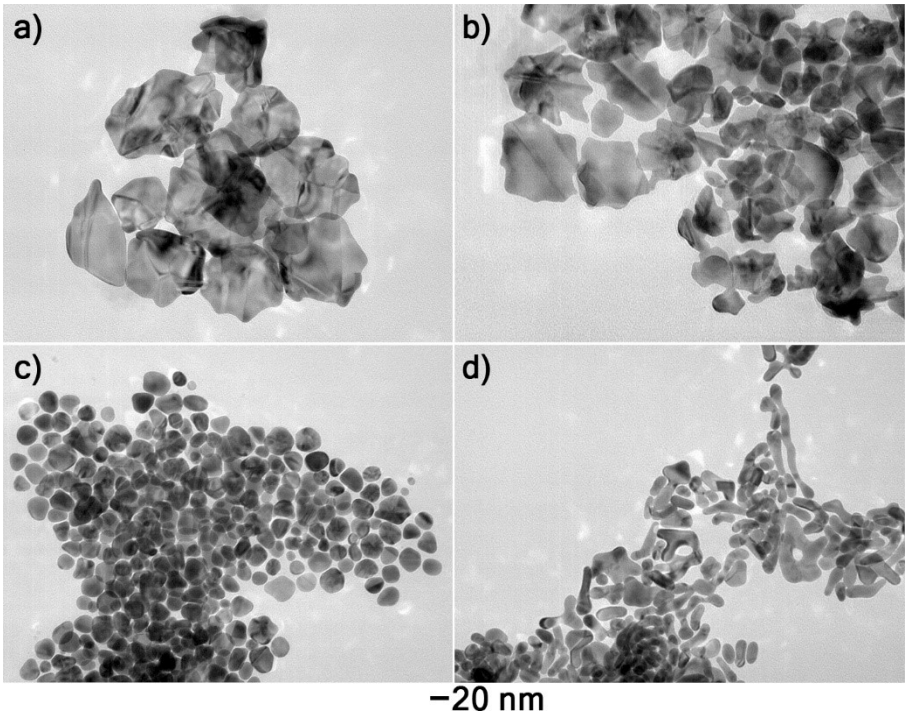

Figure S5. TEM images of products obtained *via* the standard procedure, except that the co-surfactant LAO was replaced by a) bis-(2-hydroxyethyl)-tallowamine oxide, b) N-(cocoalkyl)-dimethylamine oxide, c) N-9-octadecenylpropane-1,3-diamine, and d) decylamine, respectively.

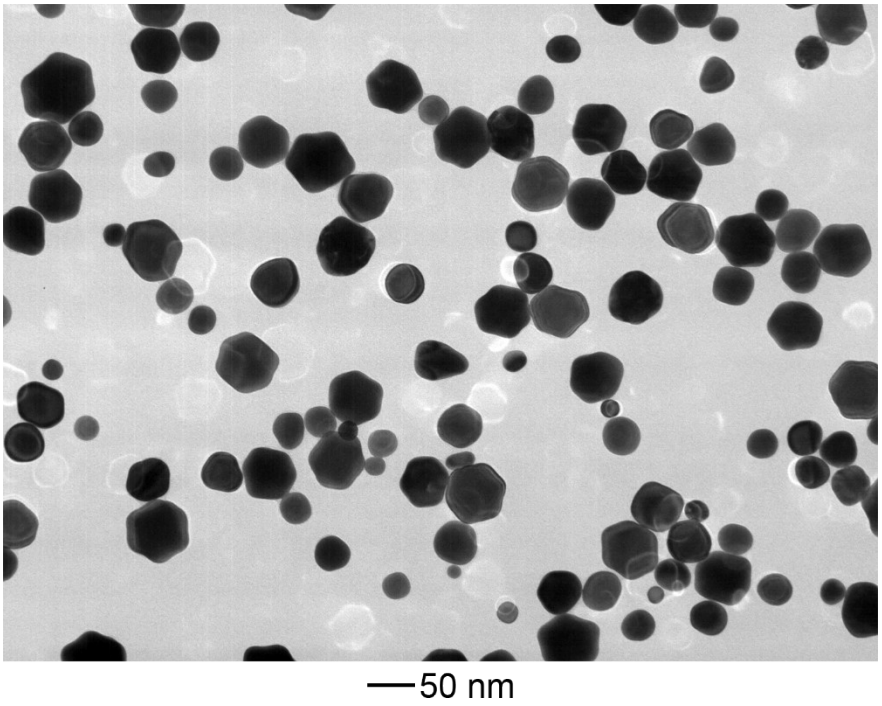

Figure S6. TEM image of quasi-spherical Au nanocrystals. They were prepared by heating the aqueous mixture of OTAC (20 mM, 5 mL), $HAuCl_4$ (1 mM, 6 mL), and AA (10 mM, 2 mL) at 60 ^oC for 1 h and collected via centrifugation.

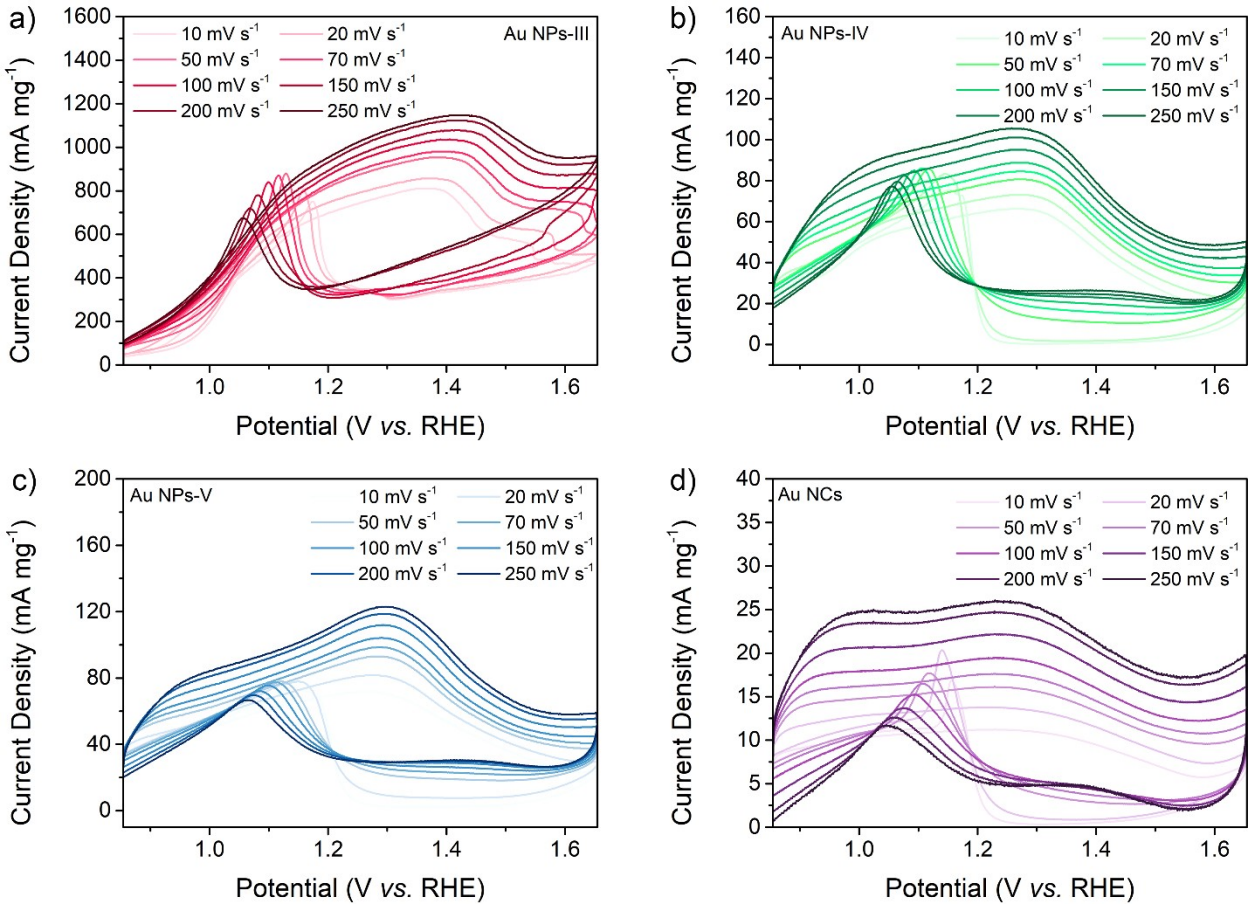

Figure S7. CV curves collected in 1 M KOH+1 M ethylene glycol under different scan rates.

Electrocatalysts: a) Au NPs-III; b) Au NPs-IV; c) Au NPs-V; d) Au NCs.

Table S1. Summary of EGOR performances of Au NPs/C and Au NCs electrocatalysts in the present study.

Electrocatalyst	E_s (mV)	E_p (mV)	Mass Activity (mA mg^{-1})	ECSA (m^2 g^{-1})	i_r/i_f	SA (mA cm^{-2})	i (t=3000s) (mA mg^{-1})
Au NPs-III/C	898.8	1385.2	956.4	16.5	1.1	5.79	343
Au NPs-IV/C	947.6	1271.0	82.5	7.9	1.2	1.05	4.70
Au NPs-V/C	976.3	1238.9	96.6	14	0.92	0.69	12.3
Au NCs/C	1021	1223.1	16.1	4.4	0.91	0.37	0.30

Table S2. Comparison of typical Au-based EGOR electrocatalysts in alkaline electrolyte.

Electrocatalyst	**Mass Activity (mA mg_{Au}^{-1})**	**Reference**
Au NPs-III	956.4	This work
Au NPs-IV	82.5	
Au NPs-V	96.6	
Au NCs	16.1	
Au nanospheres	862	[1]
Au nanocrystals	140	[2]
Core-shell AuPd@Pd nanocrystals	535.4	
Au nanocrystals	929.1	[3]

References

1. H. Xu, J. Wang, B. Yan, K. Zhang, S. Li, C. Wang, Y. Shiraishi, Y. Du and P. Yang, *Nanoscale*, 2017, **9**, 12996-13003.

2. Q. Liu, Y.-R. Xu, A.-J. Wang and J.-J. Feng, *Int. J. Hydrogen Energy*, 2016, **41**, 2547-2553.

3. H. Xu, B. Yan, K. Zhang, J. Wang, S. Li, C. Wang, Z. Xiong, Y. Shiraishi, Y. Du and P. Yang, *ACS Sustain. Chem. Eng.*, 2017, **5**, 10490-10498.