

## Efficient C-C bond splitting on Pt monolayer and sub-monolayer catalysts during ethanol electro-oxidation: Pt layer strain and morphology effects

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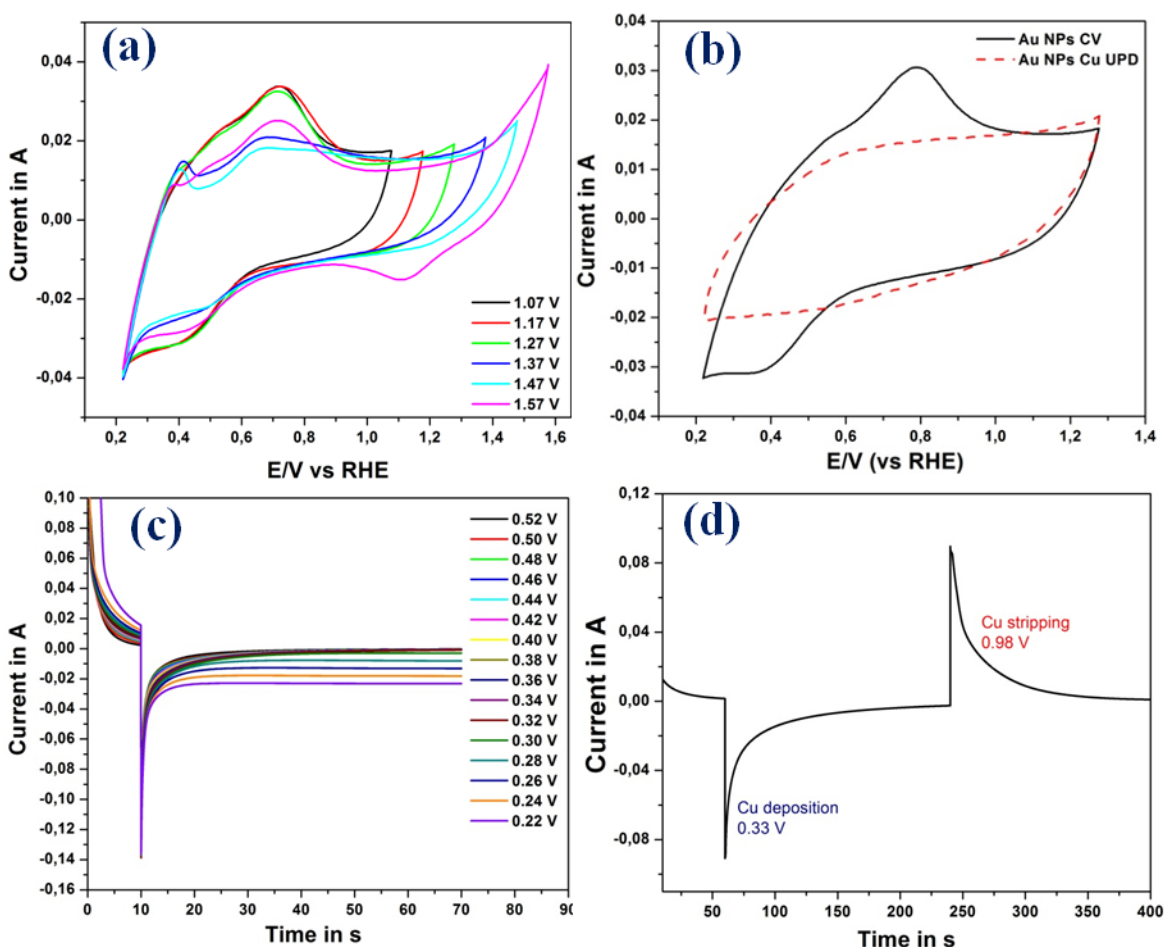
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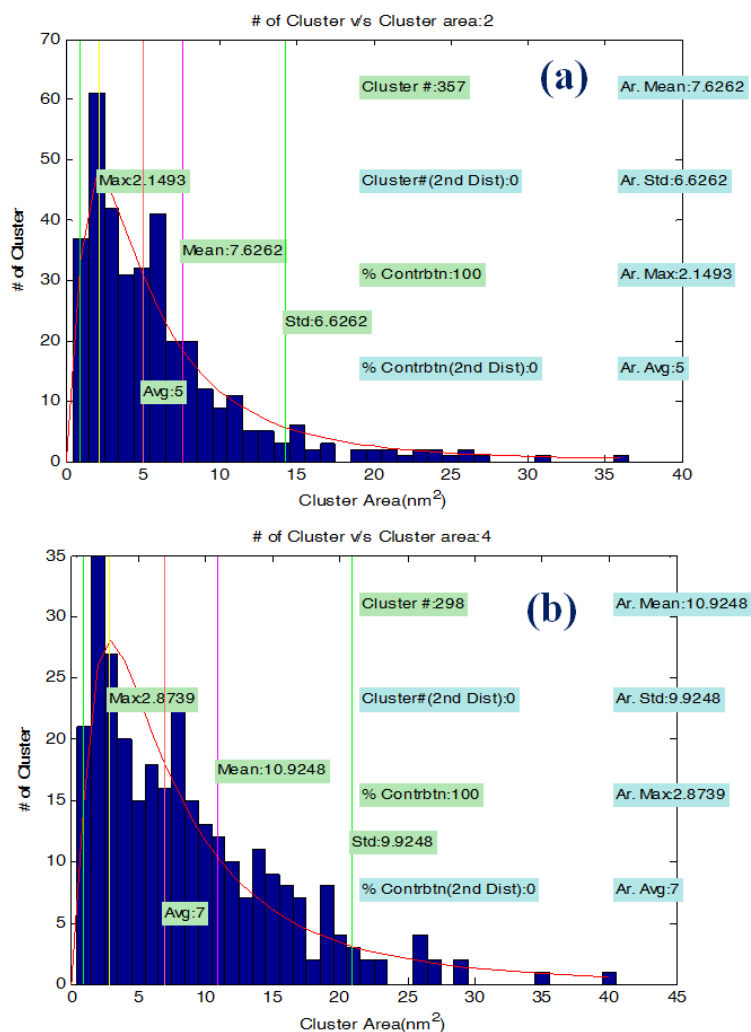
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**Figure SI. 1:** (a) Cyclic voltammogram of Au NPs in 0.5M H<sub>2</sub>SO<sub>4</sub> + 0.05M CuSO<sub>4</sub> solution at various positive potential limits (from 1.07-1.57 V) ; (b) Cyclic voltammograms of Au NPs (red-dash curve) in 0.5M H<sub>2</sub>SO<sub>4</sub> after 50 cleaning cycles at 100 mV/s; (black-solid curve) in 0.5M H<sub>2</sub>SO<sub>4</sub> + 0.05M CuSO<sub>4</sub> solution at 100 mV/s showing Cu UPD deposition and stripping peaks; (c) Chronoamperometric trajectory of initial Au conditioning (E= 0.98 V, 0 < t < 10s) following by underpotential Cu deposition (E= 0.52-0.22 V, t > 10 s) on Au nanoparticles in 0.05M H<sub>2</sub>SO<sub>4</sub> + 0.1 M CuSO<sub>4</sub> solution; (d) Chronoamperometric curve of Cu deposition at E = 0.33 V and stripping at E = 0.98 V for 100 mg of carbon supported Au NPs.



**Figure SI. 2:** Cluster size distribution analysis of STM images of (a) Au/C@Pt ML and (b) Au/C@Pt sML.

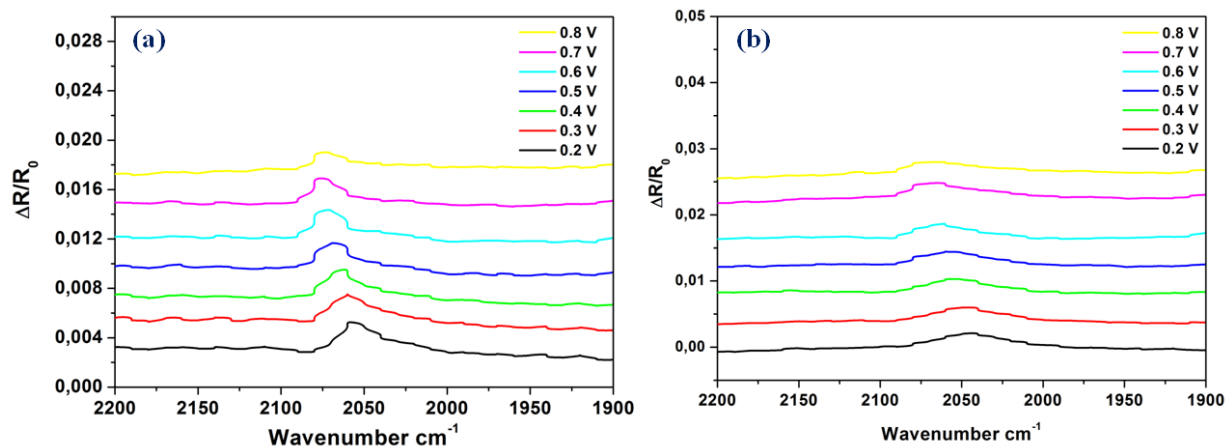


Figure SI.3. SNIFTIRS spectra for (a) Au@Pt ML and (b) Au@Pt sML in CO-saturated 0.1 M  $\text{HClO}_4$  at potential range of 0.2 to 0.8 V. Reference spectrum at 0.9 V.

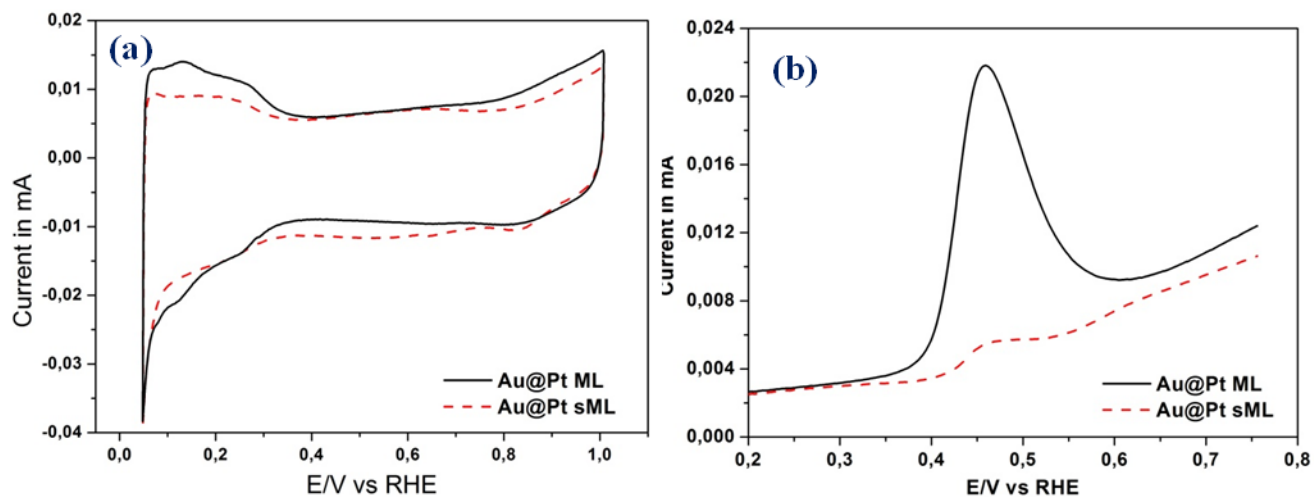


Figure SI.4. HUPD comparison (a) and CO stripping (b) curves for Au@Pt ML and Au@Pt sML at 50 mV/s.