

Supporting Information

Catechol adsorption on graphene nanoplatelets: isotherm, flat to vertical phase transition and desorption kinetics

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Supporting Information

Table S1. UV-Vis raw data for calibration line of catechol in citric acid/sodium citrate buffer solution (pH 3.0)

| Catechol concentration (mM) | Absorbance | | |
|--------------------------------|---------------|---------------|---------|
| | Measurement 1 | Measurement 2 | Average |
| 0.05 | 0.116 | 0.116 | 0.116 |
| 0.1 | 0.233 | 0.234 | 0.234 |
| 0.25 | 0.586 | 0.586 | 0.586 |
| 0.5 | 1.160 | 1.160 | 1.160 |
| 1 | 2.246 | 2.245 | 2.246 |

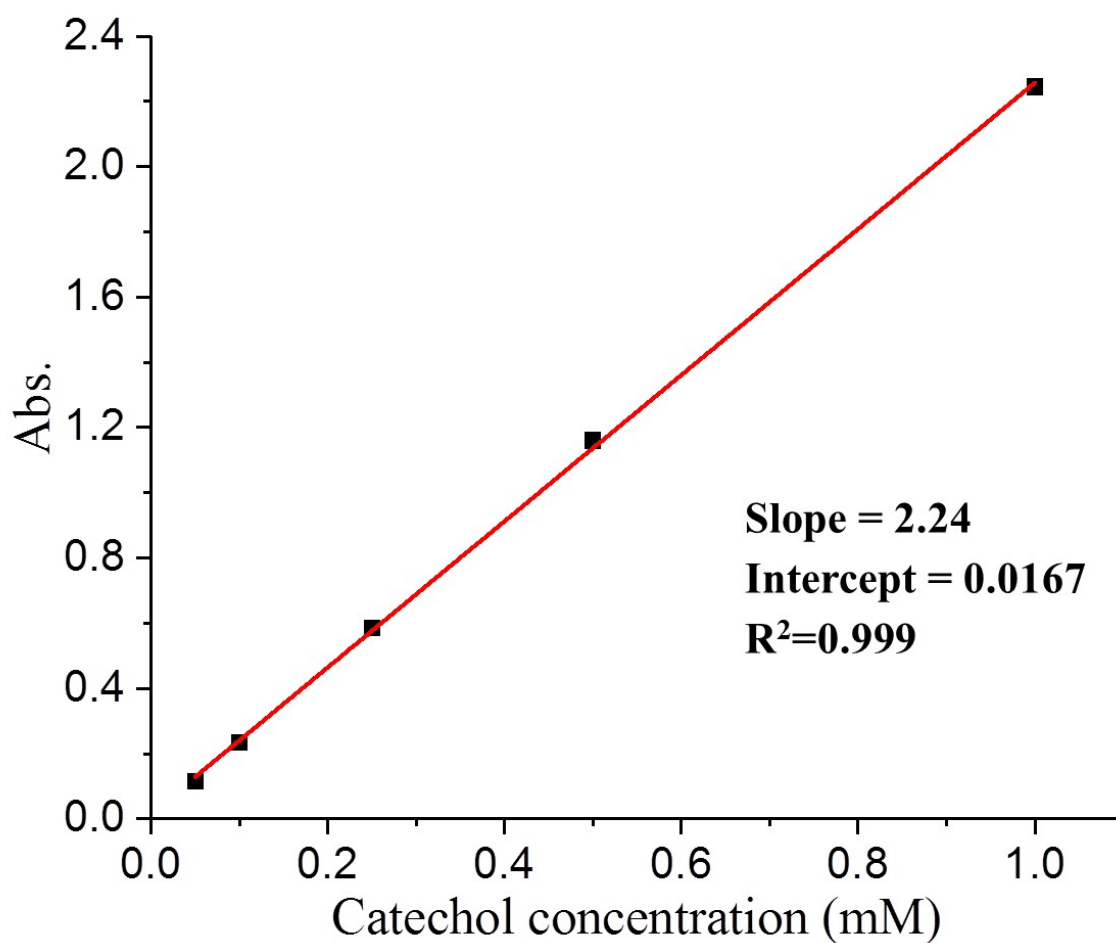


Figure S1. Calibration line of catechol in citric acid/sodium citrate buffer solution (pH 3.0)

Table S2. UV-Vis absorption raw data of catechol in citric acid/sodium citrate buffer solution (pH 3.0) before and after GNPs adsorption

| Expected catechol concentration (mM) | Dilution Factor | Abs. before GNPs adsorption | Abs. after GNPs adsorption | Amount of GNPs (mg) |
|--------------------------------------|-----------------|-----------------------------|----------------------------|---------------------|
| 1 | 1 | 2.166 | 2.011 | 2.7 |
| 1.5 | 1.5 | 2.178 | 1.954 | 4.0 |
| 2 | 2 | 2.185 | 1.908 | 5.3 |
| 2.5 | 2.5 | 2.188 | 1.869 | 6.6 |
| 3 | 3 | 2.191 | 1.806 | 8.1 |
| 4 | 4 | 2.194 | 1.769 | 10.7 |
| 5 | 5 | 2.196 | 1.707 | 13.3 |
| 10 | 10 | 2.200 | 1.556 | 26.9 |
| 20 | 20 | 2.172 | 1.771 | 26.6 |
| 50 | 50 | 2.173 | 1.962 | 26.7 |
| 100 | 100 | 2.174 | 2.044 | 26.7 |
| 150 | 150 | 2.186 | 2.030 | 39.7 |
| 200 | 200 | 2.186 | 2.036 | 39.4 |
| 250 | 250 | 2.187 | 2.038 | 41.4 |
| 300 | 300 | 2.185 | 2.043 | 45.1 |
| 350 | 350 | 2.187 | 2.056 | 46.7 |
| 400 | 400 | 2.183 | 2.052 | 53.3 |

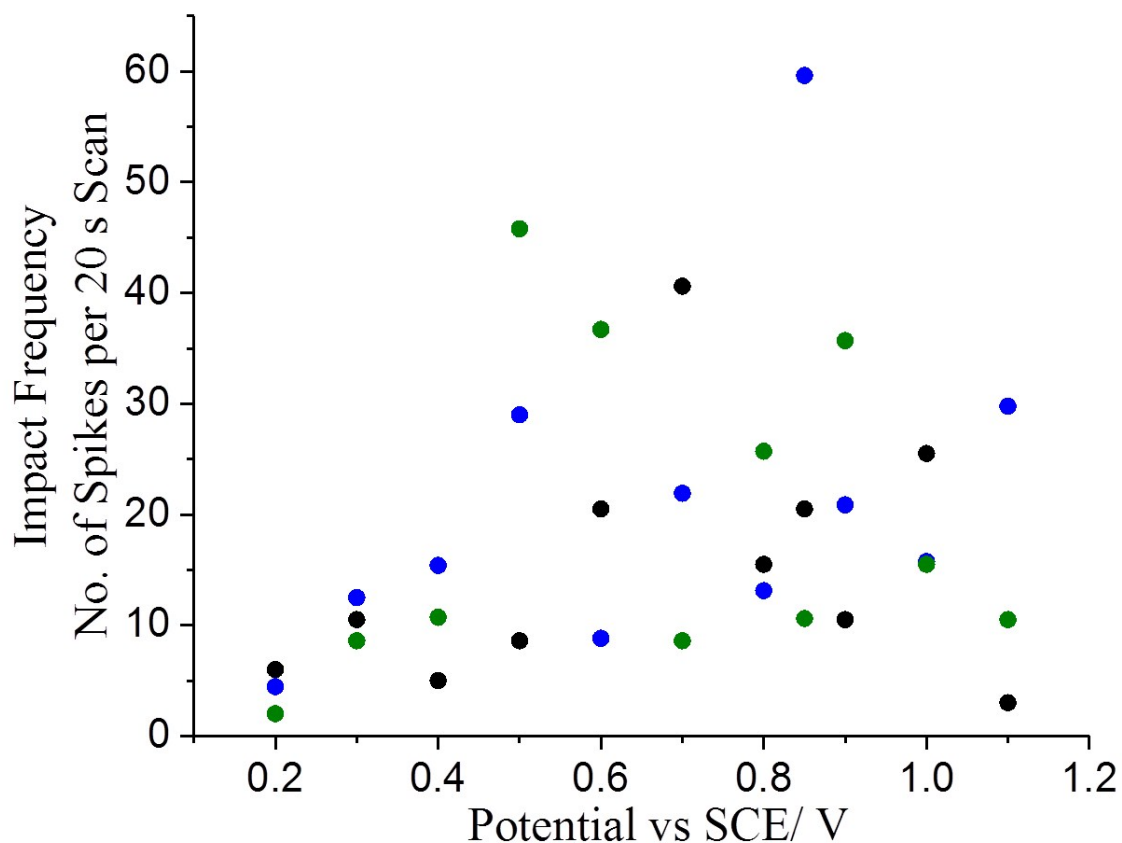
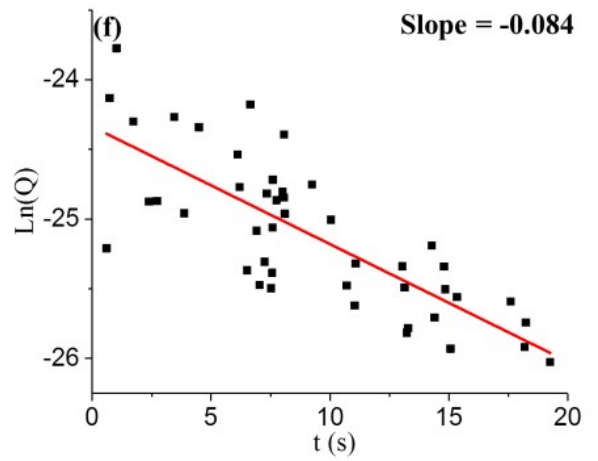
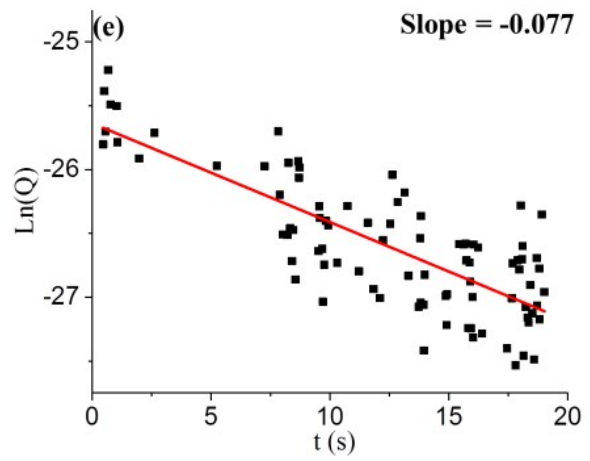
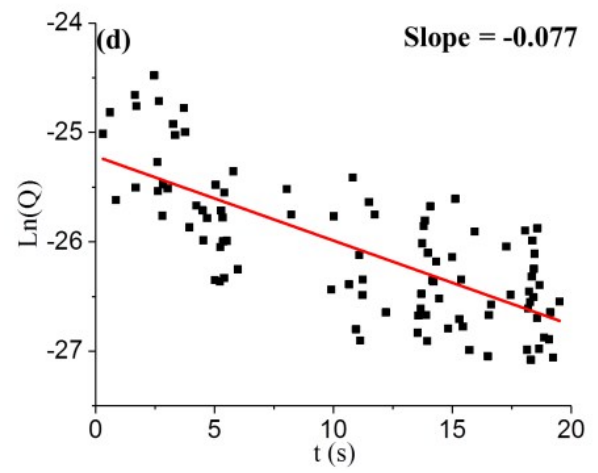
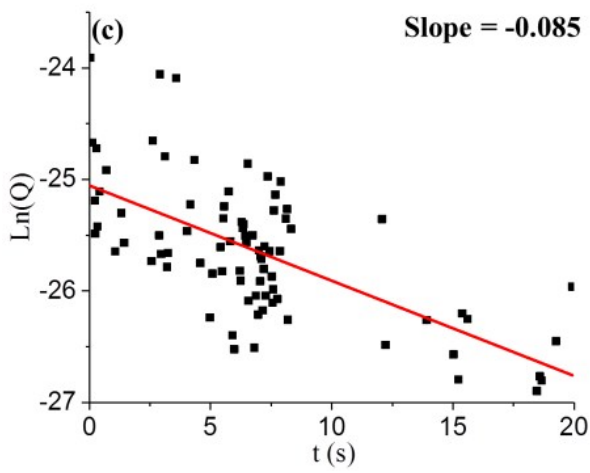
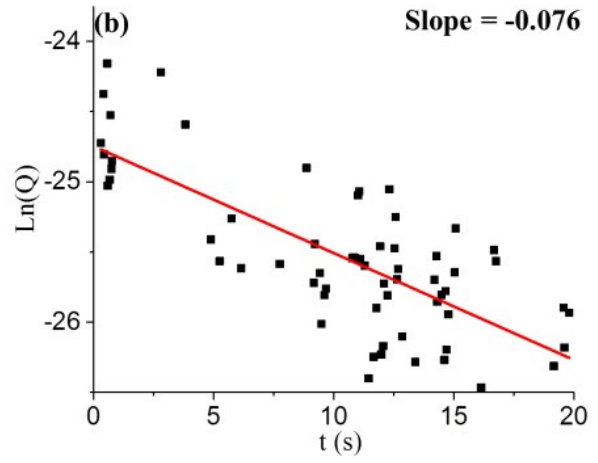
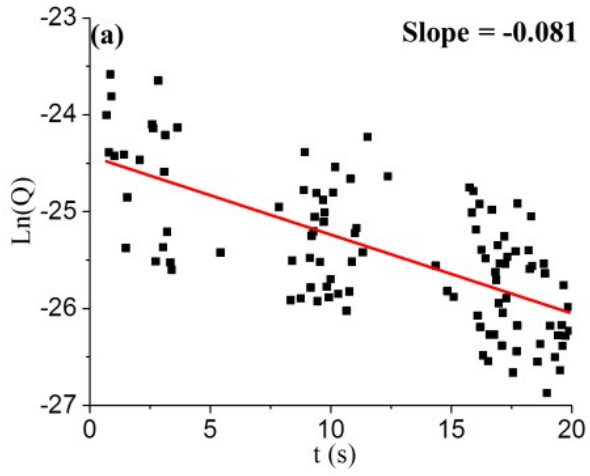


Figure S2. Plot of average impact frequency (number of spikes per 20 s scan) against potential applied (vs. SCE). Green dots: 300-catechol GNPs. Blue dots: 100-catechol GNPs. Black dots: unmodified GNPs

Figure S2 show the average number of spikes in one chronoamperometry scan (20 s) when different potential are applied to the electrode. The impact frequency follows a random distribution, consistent with the fact that particle diffusion is independent of the applied potential or modification of GNP.



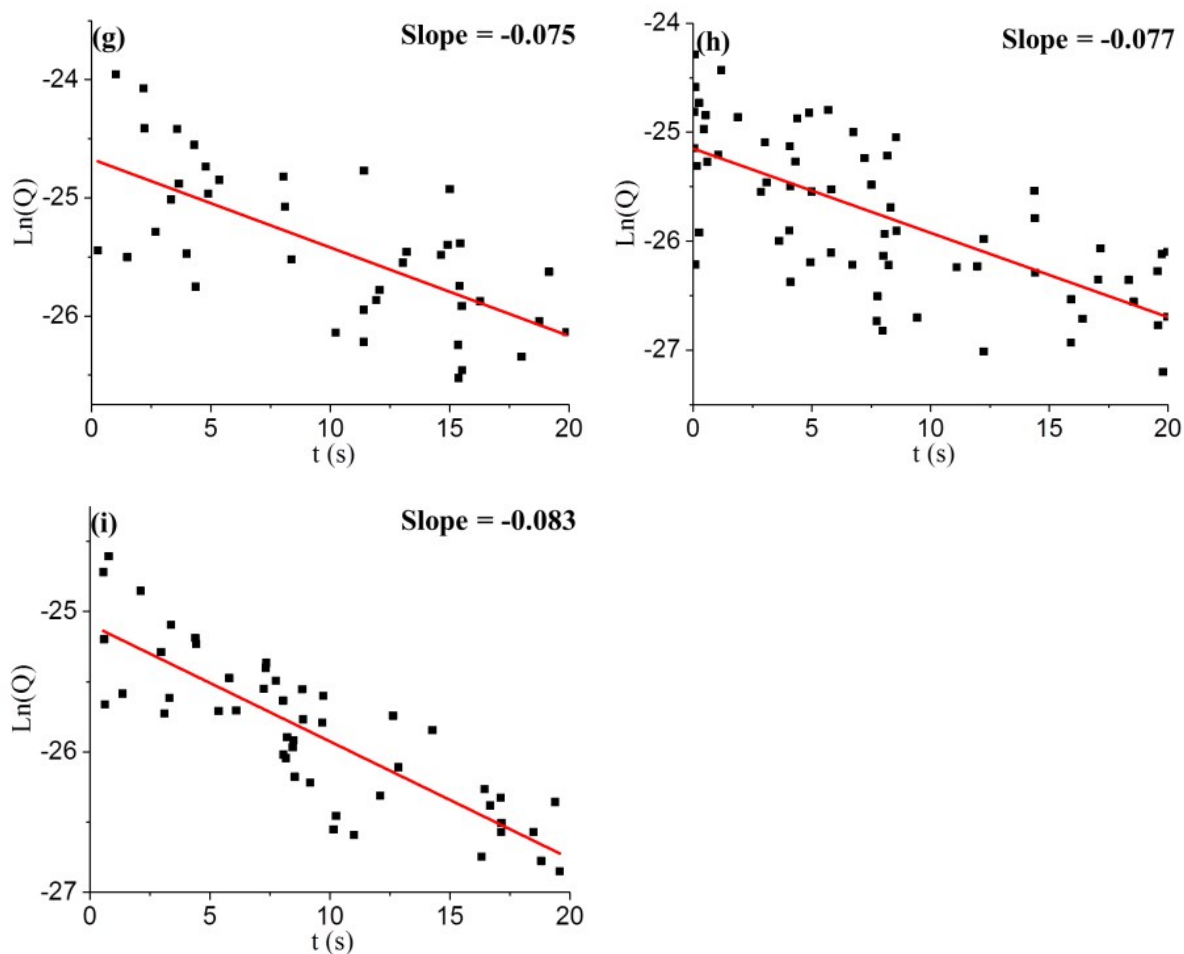


Figure S3. Additional plots of the natural logarithm of individual spike charge (Q) against time for both 100-catechol GNPs and 300-catechol GNPs at different potentials. (a) 100-catechol GNPs at +1.1 V; (b) 100-catechol GNPs at +1.0 V; (c) 100-catechol GNPs at +0.9 V; (d) 100-catechol GNPs at +0.85 V; (e) 100-catechol GNPs at +0.5 V; (f) 300-catechol GNPs at +0.9 V; (g) 300-catechol GNPs at +0.85 V; (h) 300-catechol GNPs at +0.8 V; (i) 300-catechol GNPs at +0.5 V.

Table S3. Slopes for the natural logarithm of individual spike charge (Q) against time

| Conditions | Figure Number | Slope |
|----------------------------|---------------|--------|
| 100-catechol GNPs; +1.1 V | Figure S2 (a) | -0.081 |
| 100-catechol GNPs; +1.0 V | Figure S2 (b) | -0.076 |
| 100-catechol GNPs; +0.9 V | Figure 5 (a) | -0.093 |
| 100-catechol GNPs; +0.9 V | Figure S2 (c) | -0.085 |
| 100-catechol GNPs; +0.85 V | Figure 5 (b) | -0.073 |
| 100-catechol GNPs; +0.85 V | Figure S2 (d) | -0.077 |
| 100-catechol GNPs; +0.7 V | Figure 5 (c) | -0.066 |
| 100-catechol GNPs; +0.5 V | Figure S2 (e) | -0.077 |
| 300-catechol GNPs; +0.9 V | Figure 5 (d) | -0.081 |
| 300-catechol GNPs; +0.9 V | Figure S2 (f) | -0.084 |
| 300-catechol GNPs; +0.85 V | Figure S2 (g) | -0.075 |
| 300-catechol GNPs; +0.8 V | Figure S2 (h) | -0.077 |
| 300-catechol GNPs; +0.6 V | Figure 5 (e) | -0.076 |
| 300-catechol GNPs; +0.5 V | Figure 5 (f) | -0.079 |
| 300-catechol GNPs; +0.5 V | Figure S2 (i) | -0.083 |