Supporting Information

Separationless and Adsorptionless Quantification of Individual Catechins in Green Tea with a Carbon Nanotube-Carboxymethylcellulose Electrode

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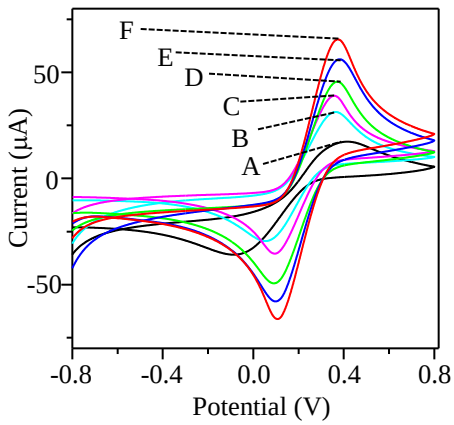

Figure S1. CV of ferricyanide for (A, black) carbon paste, (B, light blue) nornal-length MWCNT/CMC, (C, violet) long-length CNT/cellulose, (D, green) long-length CNT/sodium cholate, (E, blue) SWCNT/CMC, and (F, red) long-length CNT/CMC electrodes. The electrolyte was pH 5.3, 50 mM citric acid buffer solution containing 10 mM $K_3[Fe(CN_6)]/K_4[Fe(CN)_6]$(1:1).

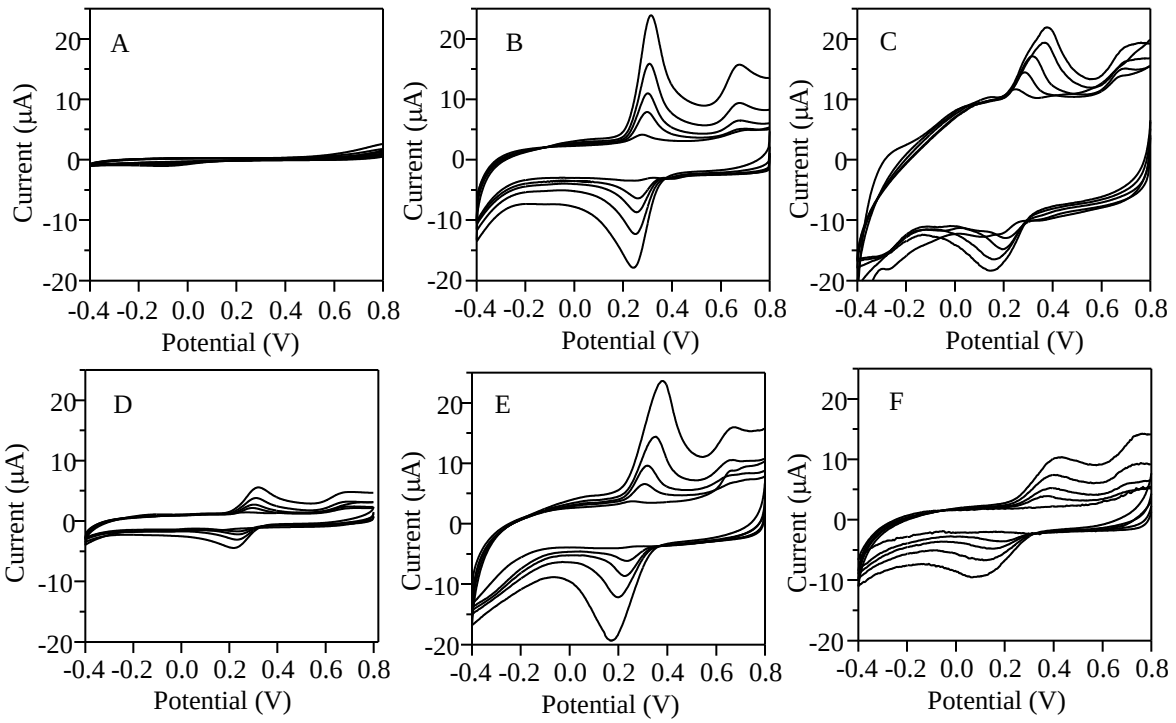

Figure S2. Cyclic voltammetry profiles of EC for various electrodes. (A) Carbon paste. (B) Long-length MWCNT/CMC. (C) SWCNT/CMC. (D) Normal-length MWCNT/CMC. (E) Long-length MWCNT/sodium cholate (F) Long-length MWCNT/water-soluble cellulose. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

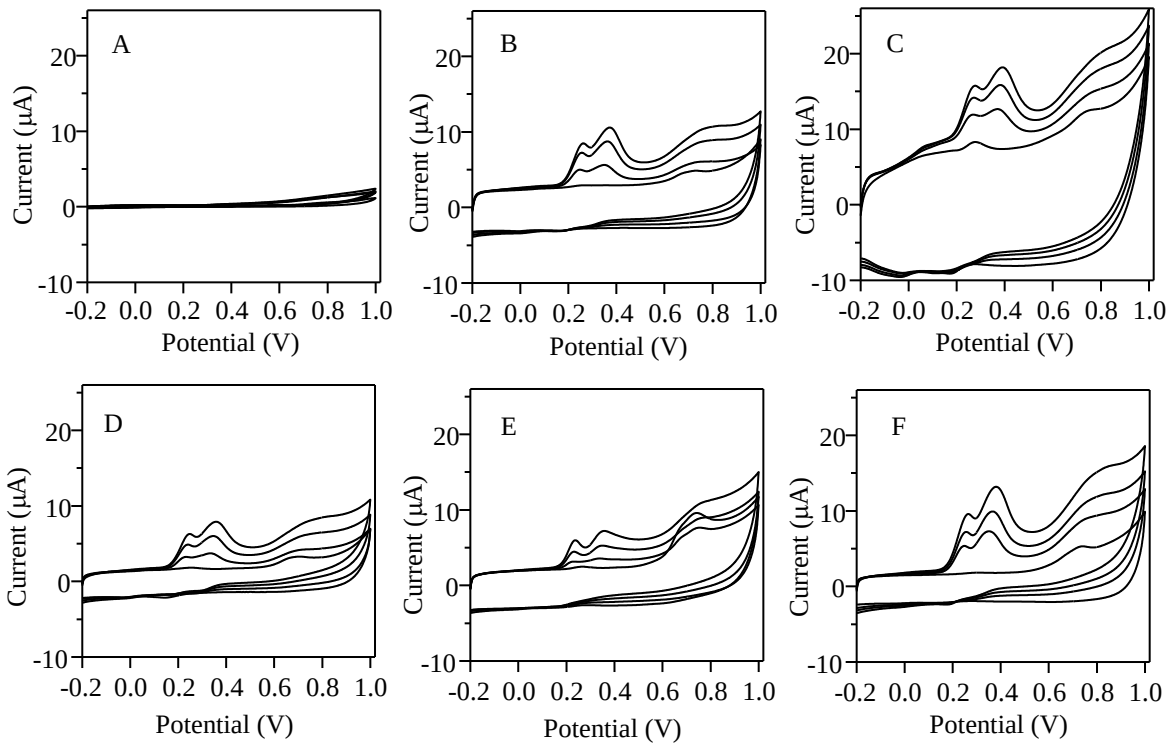

Figure S3. Cyclic voltammetry profiles of EC for various electrodes. (A) Carbon paste. (B) Long-length MWCNT/CMC. (C) SWCNT/CMC. (D) Normal-length MWCNT/CMC. (E) Long-length MWCNT/sodium cholate (F) Long-length MWCNT/water-soluble cellulose. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

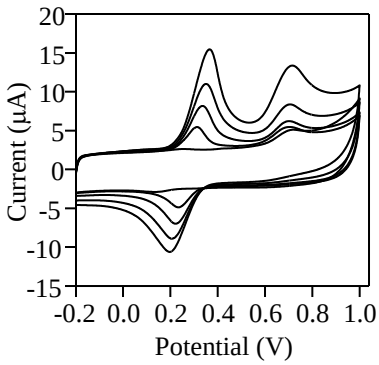

Figure S4. Cyclic voltammetry profiles of CA for CNT/CMC electrodes. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

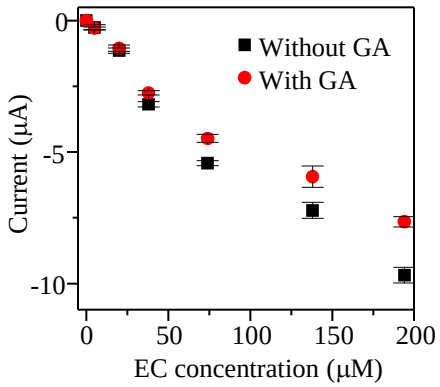

Figure S5. Comparison of reduction current peaks (Peak II) of EC in the absence (I_a(EC)) and the presence (I_a(EC+GA)) of GA based on Fig. 5A and 5E.

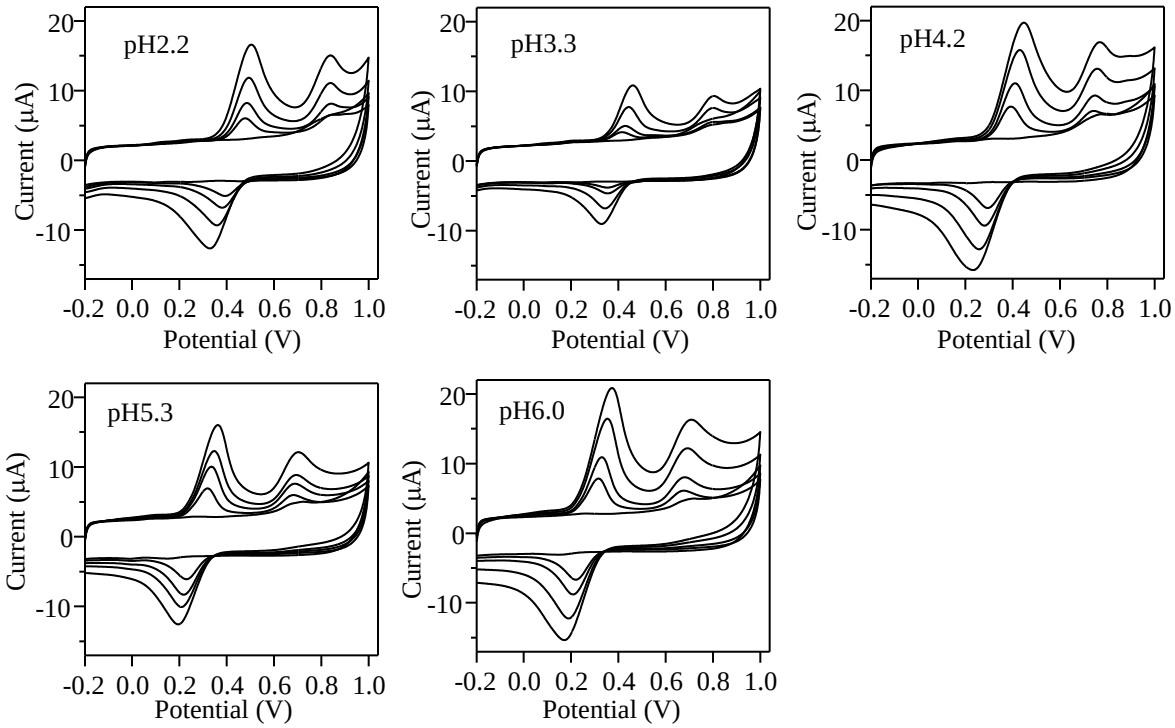

Figure S6. Cyclic voltammetry profiles of EC for CNT/CMC electrodes at various pH 2.2, 3.3 4.2, 5.3, amd 6.0. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

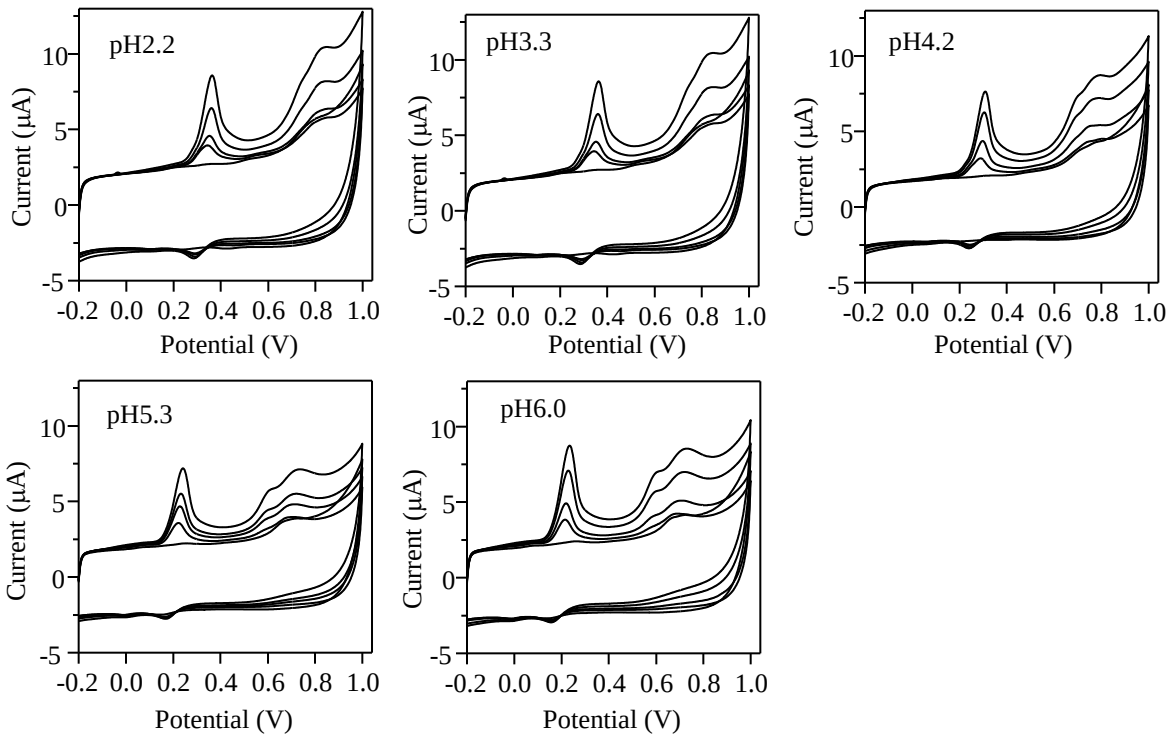

Figure S7. Cyclic voltammetry profiles of EGC for CNT/CMC electrodes at various pH 2.2, 3.3 4.2, 5.3, amd 6.0. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

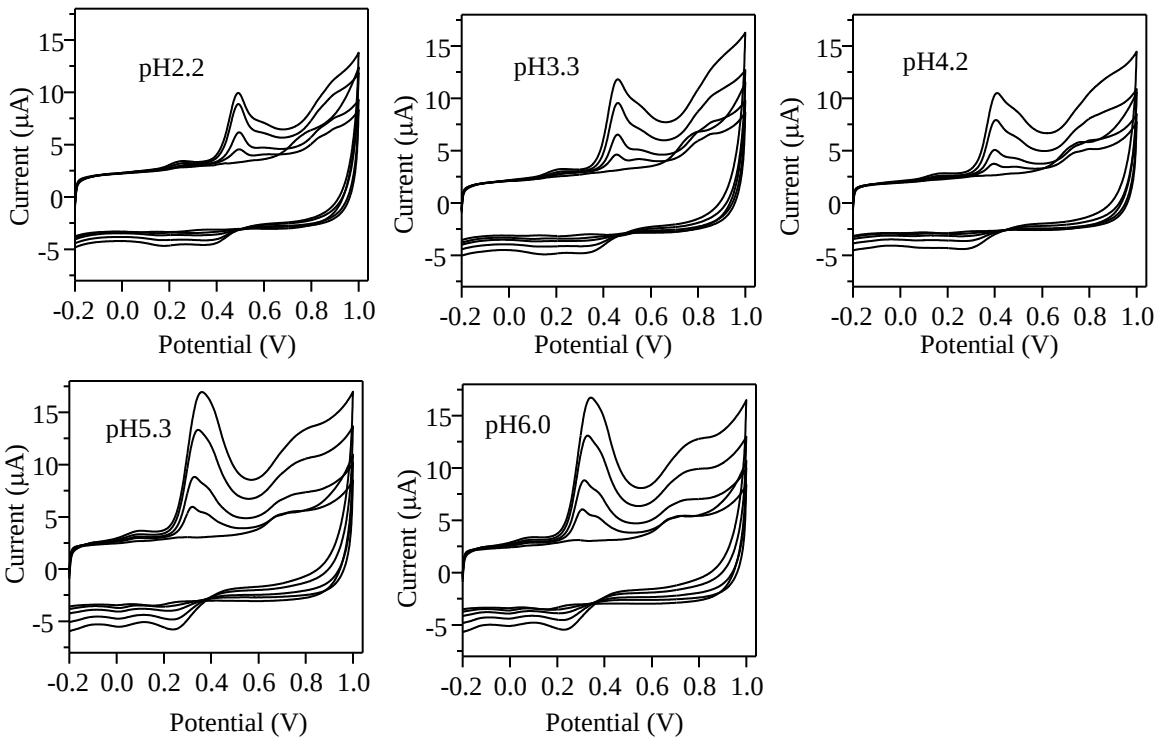

Figure S8. Cyclic voltammetry profiles of ECG for CNT/CMC electrodes at various pH 2.2, 3.3 4.2, 5.3, amd 6.0. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

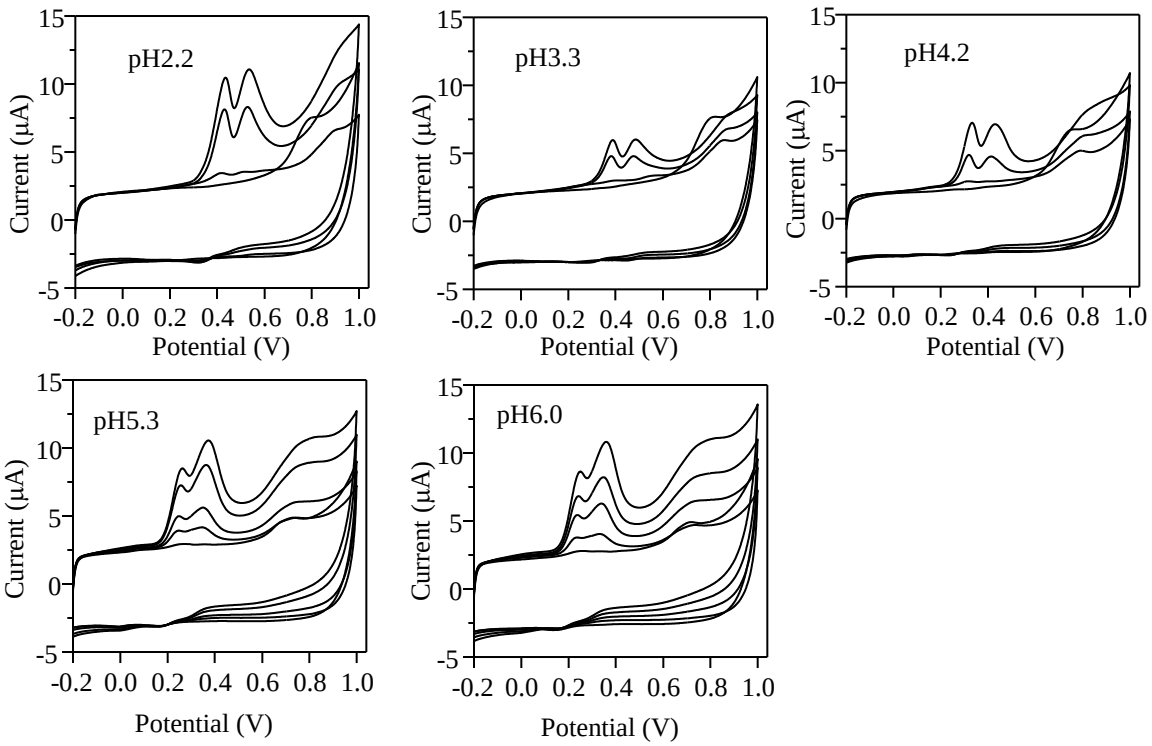

Figure S9. Cyclic voltammetry profiles of EGCG for CNT/CMC electrodes at various pH 2.2, 3.3 4.2, 5.3, amd 6.0. Concentrations are 0, 5, 20, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

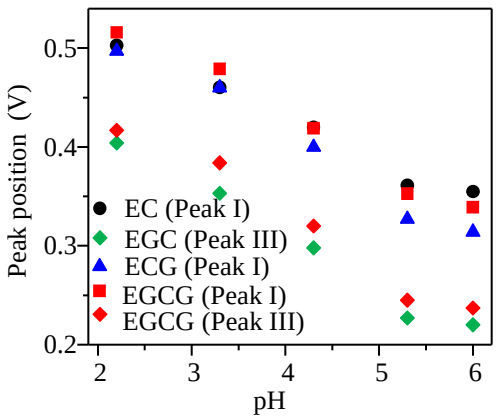

Figure S10. Plot of peak position versus pH for catechins on cyclic voltammograms, which are shown in Fig. S6-9.

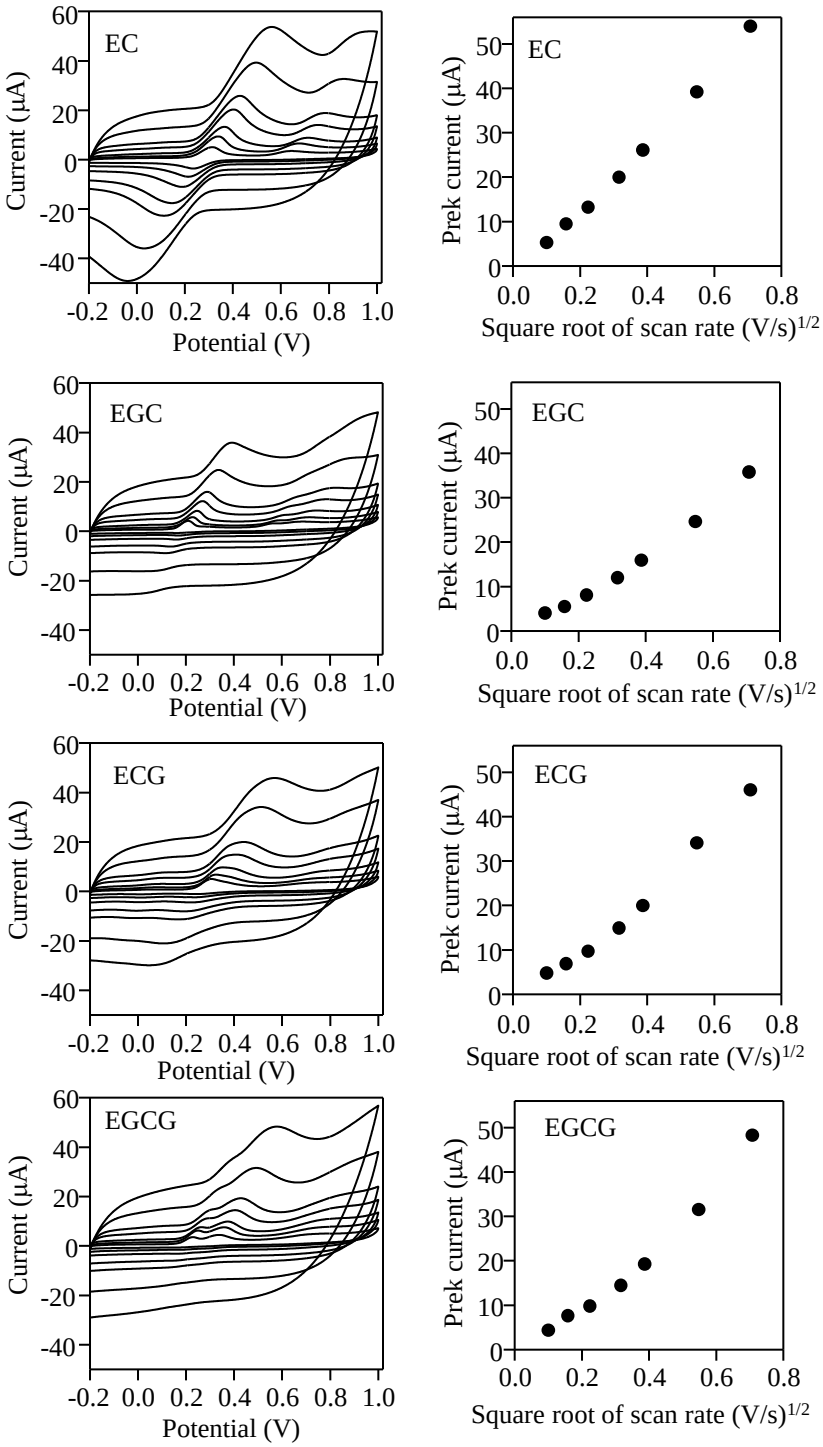

Figure S11. (Right) Cyclic voltammetry of catechins at CNT/CMC. Scan rates: 0.01, 0.025, 0.05, 0.10, 0.20, 0.30, and 0.50 V s^{-1}. (Left) Dependence of peak current on square root of potential sweep rate. Plots of peak current versus scan rate. Concentration is 194 μM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution.

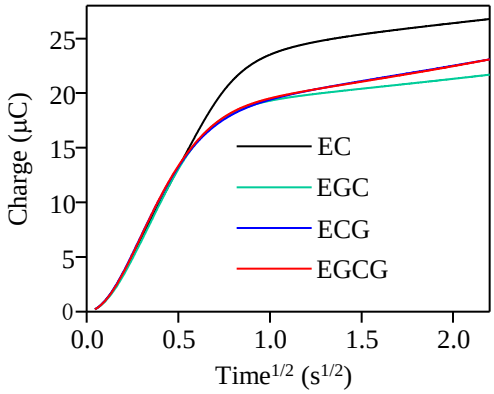

Figure S12. Chronocoulometric plot of catechins at CNT/CMC electrode. Concentration is 74 µM. The electrolyte used was a pH 5.3, 50 mM citric acid buffer solution.

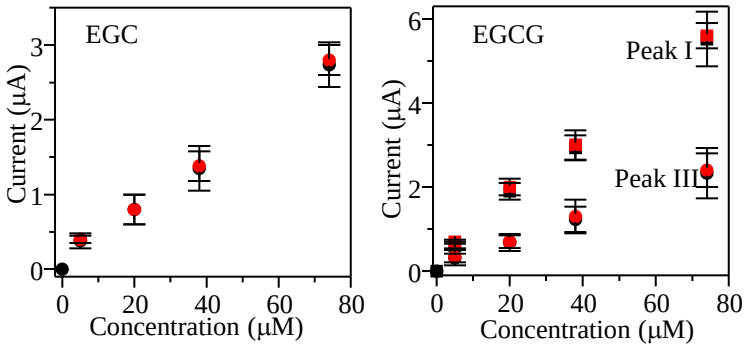

Figure S13. CV current versus concentration plot of EGC and EGCG for CNT/CMC electrodes without (black dots) and with (red dots) accumulation time (2.5 min).. The solution used was in 50 mM pH 5.3 citric acid solution. Scan rates is 0.05 V s^{-1}.

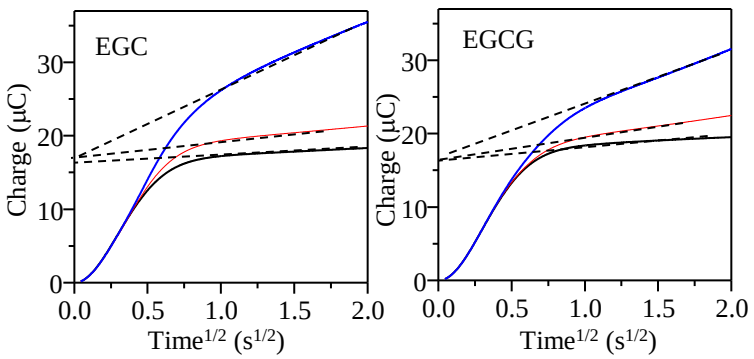

Figure S14. Chronocoulometric plot of various concentrations of EGC and EGCG at CNT/CMC electrode. Concentration is 0, 74, 138 μM. The electrolyte used was a pH 5.3, 50 mM citric acid buffer solution.

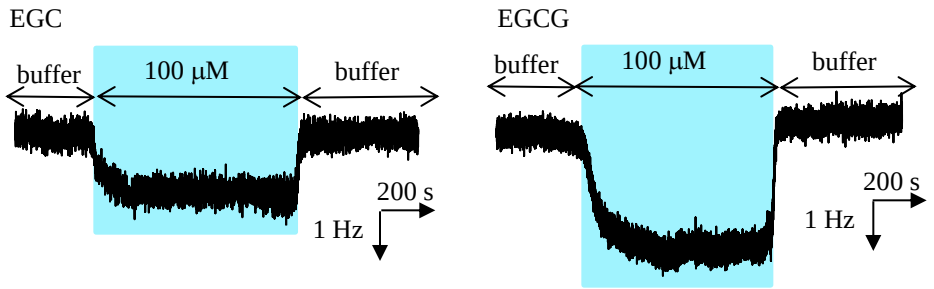

Fig. S15. Frequency versus time plots on CNT/CMC electrode with EGC and EGCG solution flow of quartz crystal microbalance (QCM). The buffer used was in 50 mM pH 5.3 citric acid solution. The QCM instrument used was Q-Sense Explorer (Meiwafosis Co. Ltd., Tokyo, Japan) with 10 mL cells equipped with an AT-cut 5 MHz QCM plate (8 mm diameter quartz plate and an area of 4.9 mm^2 of gold electrode) at the bottom of the cell along with a stirring bar with a temperature control system. Frequency shifts at the third overtones (15 MHz) were employed. The solutions were flowed with a peristatic pump and flow rate was 0.1 mL min^{-1}.

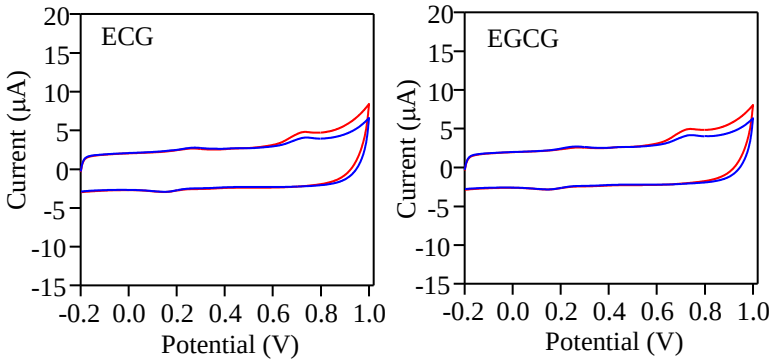

Figure S16. Cyclic voltammetry profiles of CNT/CMC electrodes in 50 mM pH 5.3 citric acid buffer solution before (red line) and after (blue line) immersed in 100 μM EGC and EGCG solution. Scan rates is 0.05 V s^{-1}.

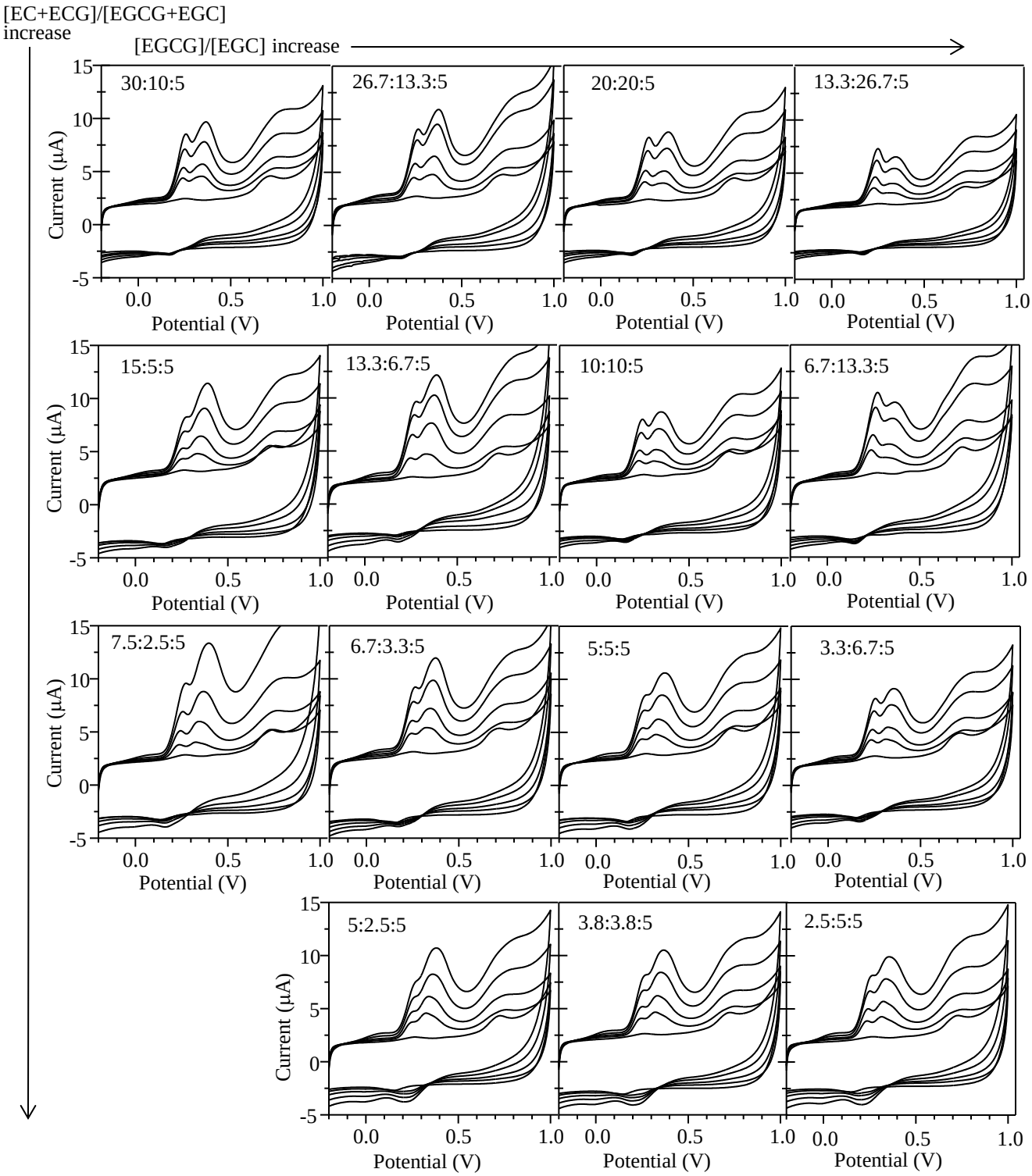

Figure S17. Simulated CVs of mixture solution of catechins. Molar ratio of catechins (EGCG]:[EGC]:[EC+ECG]) are shown in figures. Concentrations are 0, 38, 74, 138, and 194 μM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

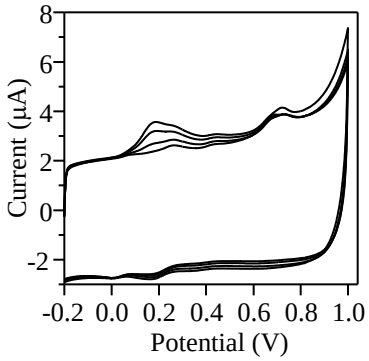

Figure S18. Cyclic voltammetry profiles of AA for the CNT/CMC electrodes. Concentrations are 0, 0.5, 1.0, and 1.5 mM. The electrolyte used was in 50 mM pH 5.3 citric acid buffer solution. Scan rates is 0.05 V s^{-1}.

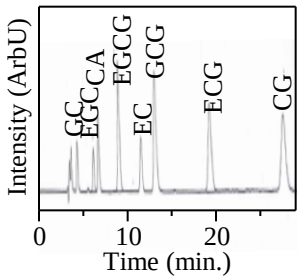

Figure S19. HPLC chromatograms of catechin standards. GC: gallocatechin, GCG: galloactechin gallate, CG: catechin gallate