Protein Detection Based on Small Molecule-linked DNA

Supporting Information

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Probe Density Optimization. To obtain the optimal surface coverage of probe 2 on the electrode surface, the signal gain has been studied by measuring the background signal and DPV response for detecting FR at different surface densities, which can be controlled by varying the probe concentration during the immobilization process. [1-3] As is shown in Figure S-1, the signal gain increases with the probe concentration and reaches a maximum value for 1 μM probe 2 modification. The surface density of probe 2 was then calculated to $5.4*10^{12}$ molecules/cm^2 by chronocoulometric measurement based on the assumption that redox active hexaammineruthenium(III) (RuHex) cation associates with anionic phosphate backbone of DNA.[3-6] The charge corresponding to RuHex electrostatically bound to surface-confined DNA (Q_{ss}) can be calculated from the following equation: $Q_{ss} = Q_{total} - Q_{dl}$ (Q_{total} is the total charge flowing through the electrode and Q_{dl} is the nonfaradaic (capacitive) charges). The relationship between the surface density of electroactive probe (Γ) and Q_{ss} obeys the following equation:

$$\Gamma_{ss} = (Q_{ss}N_A/nFA) / (z/m)$$

where n is the number of electrons transferred in the reaction (n=1), F represents the Faraday constant (coulombs per equivalent), A is the effective surface area of gold electrode (square centimeters), m is the number of nucleotides in the DNA, z is the charge of the redox molecules, and N_A is Avogadro's number.

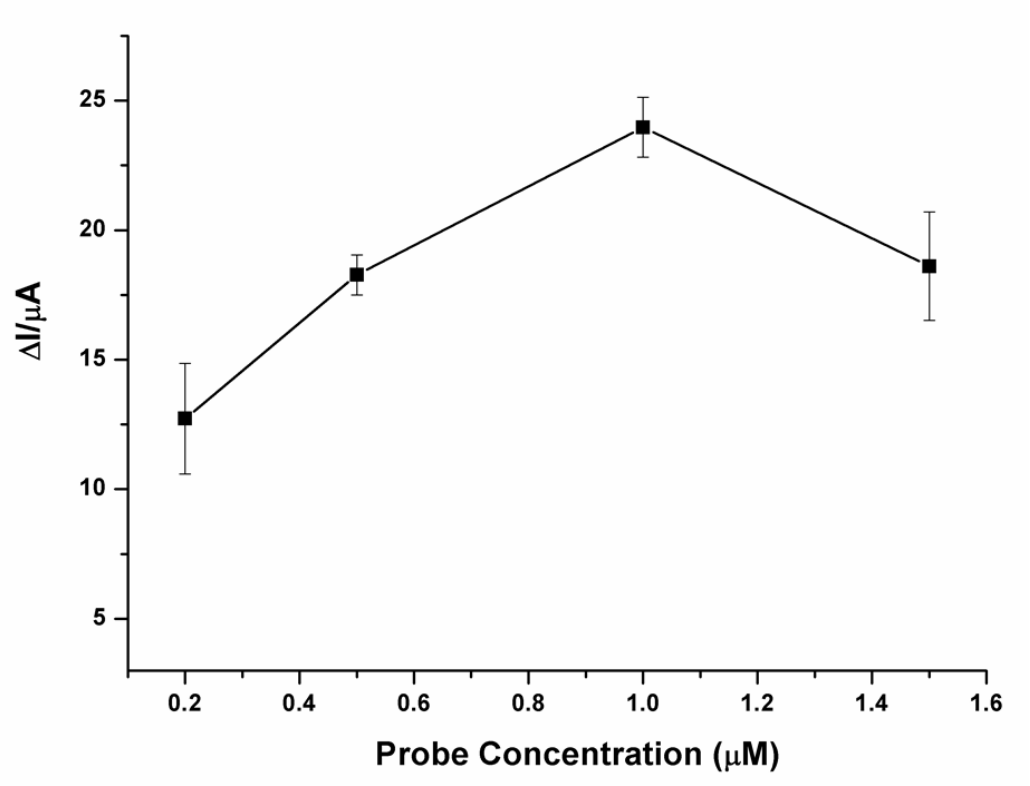

Figure S-1. The relationship between the DPV signal gain (ΔI) and the probe 2 concentration. Error bars represent standard deviations of measurements (n=3). FR concentration: 15 ng/mL.

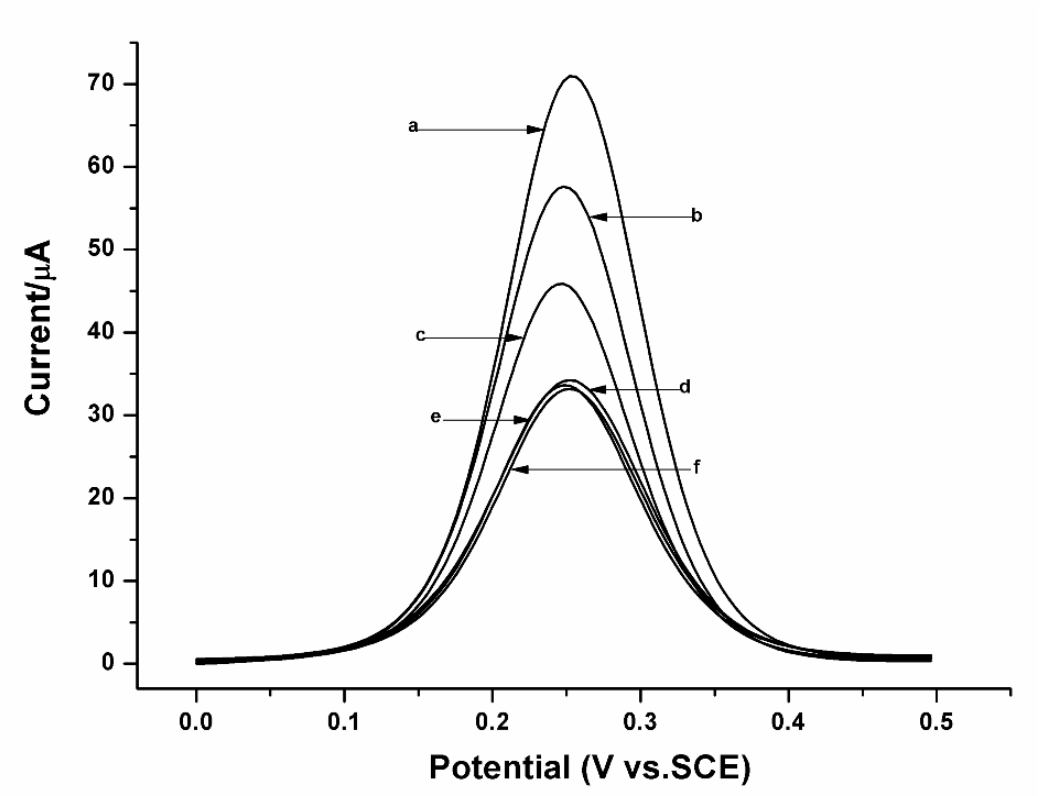

Figure S-2. DPVs for the measurements of streptavidin with different concentrations (a) 30, (b) 15, (c) 7.5, (d) 0 ng/mL. Curves e and f show the control experimental results that FR (15 ng/mL) and thrombin (0.037 mg/mL) were used instead of streptavidin. Biotin-probe 1 was used for detecting streptavidin. Other conditions same as in Figure 2.

References

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