Supplementary Information

Ultra-sensitive and wide-dynamic-range sensors based on dense arrays of carbon nanotube tips

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The performance of CNTAE is size dependent, and larger area CNTAE has higher signal-to-noise ratio. A serial of signal currents and background currents with different electrode areas have been measured, and the resultant relationship is plotted in Figure S1. It is clearly seen that both the signal current and background current of the as-fabricated CNTAE have almost linear relationships to electrode areas. The variation rate of signal current is faster than that of background current, with S/N = 55.2-5.74/ (0.1799A + 0.1565), where A represents electrode area. As the electrode area increases, the S/N increases.

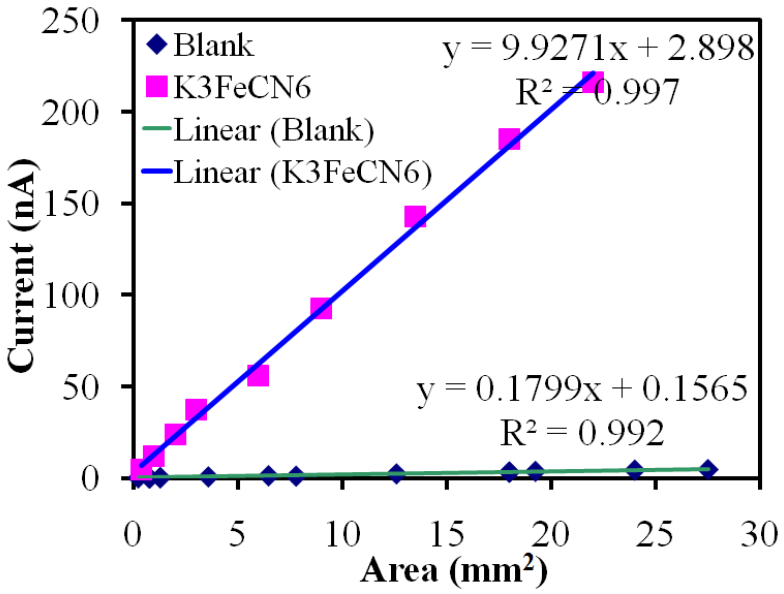

Figure S1. Dependences of signal current and background current on electrode area.

Two specific electrodes with areas of 24 mm^2 and 1.3 mm^2 were measured in K_3FeCN_6 solution at nM level to verified the variation of S/N. Figure S2 shows typical CVs of these two electrodes recorded at a potential sweep rate of 50 mV/s for K_3FeCN_6 reduction at concentrations of 10 nM, 30 nM, 50 nM and 100 nM. Evidently, the response for a concentration of 10 nM at 24 mm^2

CNTAE is more discernible compared with the case of 1.3 mm^2 CNTAE. The detection limits of these two electrodes could be obtained, which are 30 nM (S/N = 2.1 for 24 mm^2 CNTAE) and 100 nM (S/N = 2.2 for 1.3 mm^2 CNTAE) respectively. This has a good match to the variation of S/N in Figure S1.

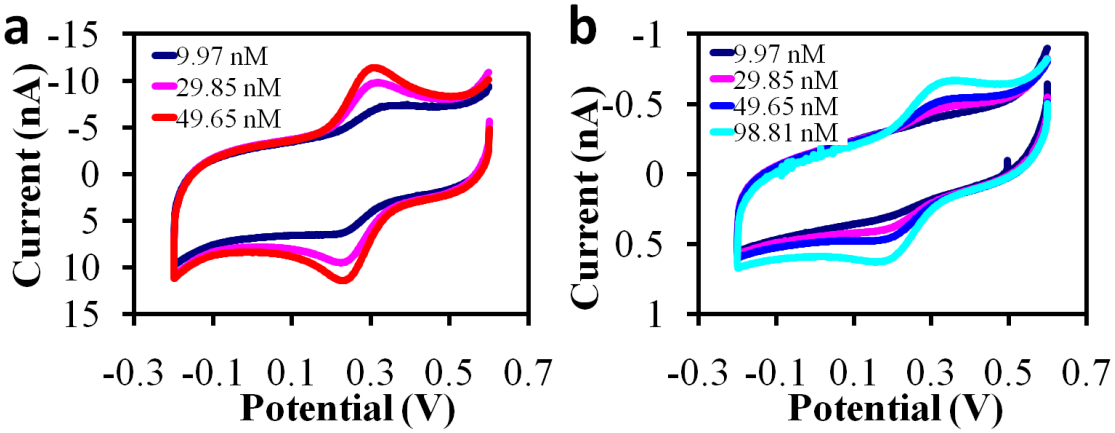

Figure S2. CVs of K_3FeCN_6 at different concentrations: (a) electrode with an area of 24 mm^2 and (b) electrode with an area of 1.3 mm^2.