

Supporting information

for

Origins of charge noise in carbon nanotube field-effect transistor biosensors

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A. Supporting information for Figure S1: Variability of Platinum electrode at the trench interface

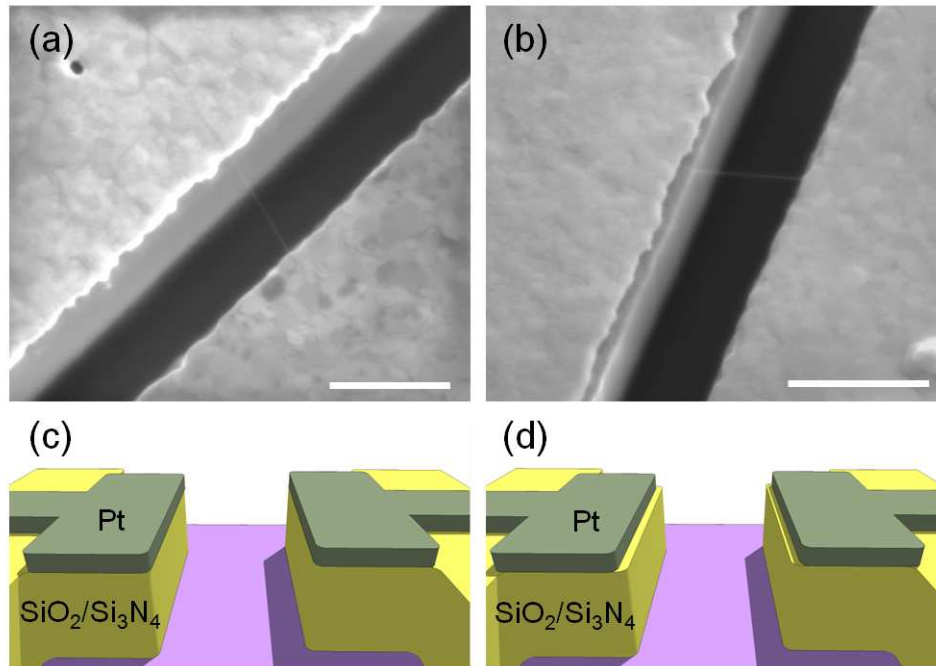


Figure S1. SEM images illustrating device variability at the CNT-trench interface occurring after the fast-heat CVD CNT growth process, scale bars are 1 μm . (a) Ideal electrode geometry with Pt electrodes extending to the edge of the trench. (b) Non-ideal electrode geometry. The Pt has receded from the edge of the trench. The CNT can touch the exposed insulating surface before crossing the trench. (c) Schematic of the ideal electrode geometry. (d) Schematic of the non-ideal electrode geometry.

B. Supporting information for Figure S2: Pristine suspended device exposed to 1 μ M HHCC

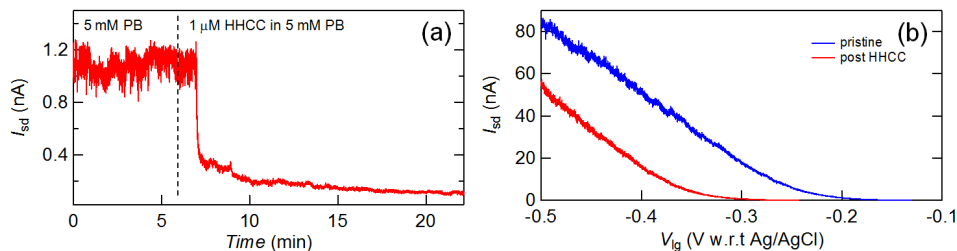


Figure S2. Horse heart cytochrome-c (HHCC) binding to the surface of a clean suspended CNT. (a) Current vs. time as a 1 μ M concentraion of HHCC is introduced. $V_{sd} = 25$ mV and $V_{lg} = -200$ mV. (b) Current vs. V_{lg} before and after exposure to HHCC. $V_{sd} = 25$ mV.

C. Supporting information for Figure S3: Pristine suspended device exposed to 200 nM PLL

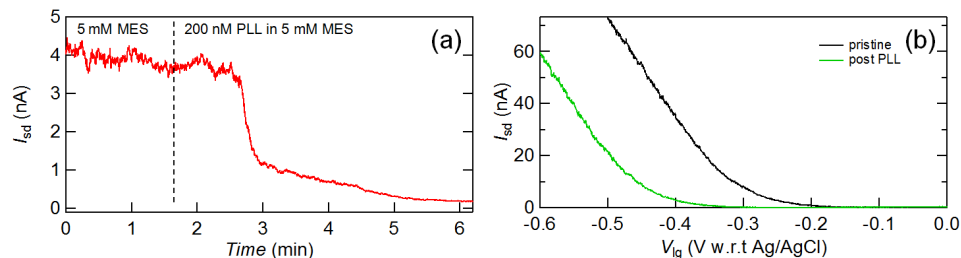


Figure S3. Poly-L-lysine (PLL) binding to the surface of a clean suspended CNT. (a) Current vs. time as a 200 nM concentraion of PLL is introduced. $V_{sd} = 25$ mV and $V_{lg} = -250$ mV. (b) Current vs. V_{lg} before and after exposure to PLL. $V_{sd} = 25$ mV.

D. Supporting information for Table S1: Suspended CNT noise increase after protein coating

Protein	$\delta V_{rms}^{before} (mV)$	$\delta V_{rms}^{after} (mV)$	$\delta V_{rms}^{adsorbate} (mV)$
HHCC	0.79	1.26	0.98
HHCC	1.14	1.44	0.88
HHCC	1.18	1.41	0.77
HHCC	0.85	2.86	2.73
HHCC	0.63	0.83	0.54
PLL	0.87	1.67	1.42
PLL	1.12	1.46	0.94
PLL	0.65	0.91	0.64
			$\langle \delta V_{rms}^{adsorbate} \rangle = 1.11 \pm 0.71$

Table S1 shows a large spread in $\delta V_{rms}^{adsorbate}$ values. The source of this variance is currently unknown and warrants further study. It is possible that the variance reflects the way that adsorbates pack on the CNT surface.