Supplementary Information of "Challenges in Aptamer-Based Sensor Development Using Carbon Nanotube Networks"

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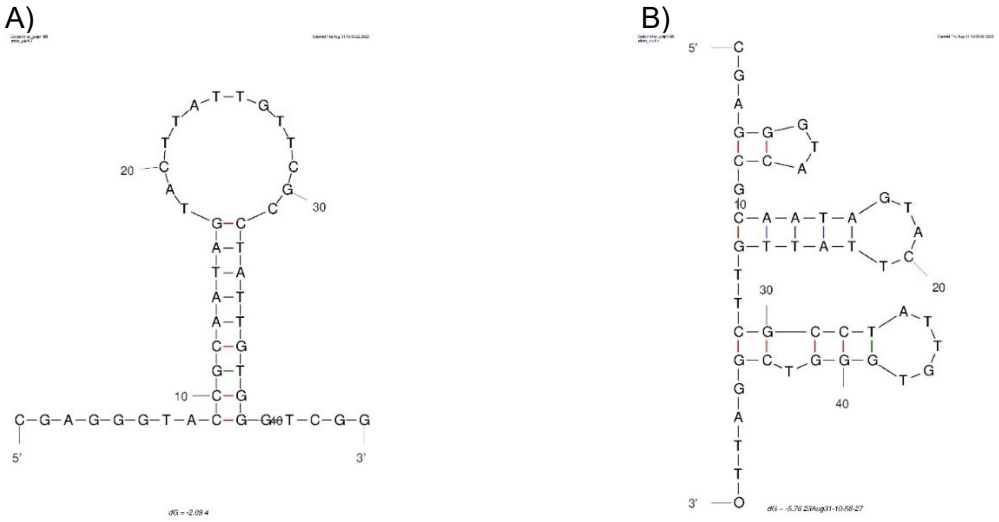

Figure SI1. *Scheme of the two possible aptamer structures obtained with M-fold.*

EDC/NHS ratio and concentration optimization

Table SI1. *Peak shift at 160Hz of three electrodes activated with different ratios and concentrations of EDC/NHS.*

Ratio	[EDC] (M)	[NHS] (M)	Peak shift (mV) at 160Hz		
			BG-VA	BGA-VA	BG-BGA
1:1	0.005	0.005	-3.1	-9.1	6.0
1:2	0.1	0.2	-6.0	-6.0	0.0
4:1	0.2	0.05	-3.1	-9.1	6.0

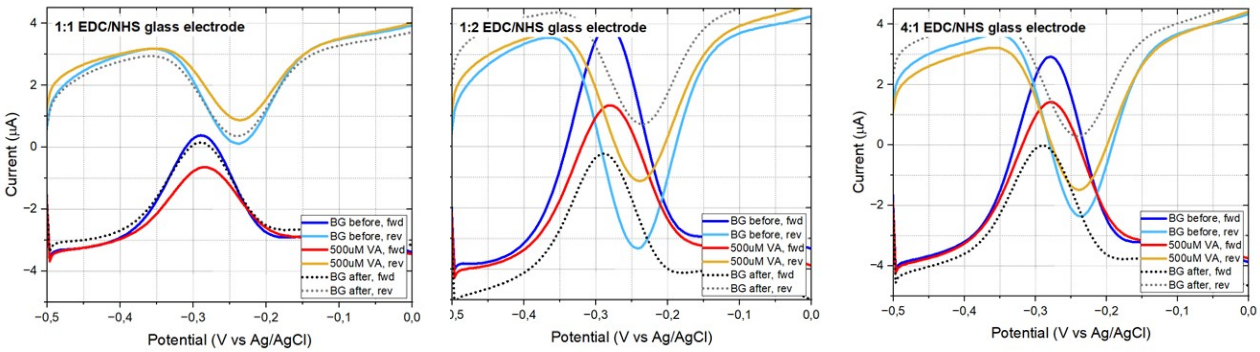

Figure SI2. *SWVs of three electrodes with different ratios and concentrations of EDC/NHS.*

Optimal frequency study

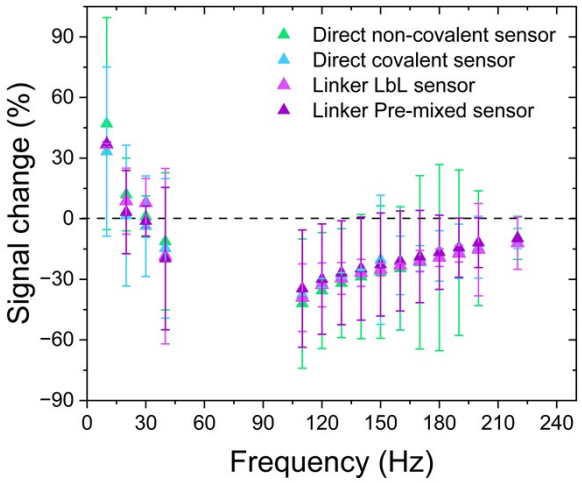

Figure SI3*. Comparison of the signal change at different frequencies for the four studied EAB sensors.*

Table SI2*. Forward peak current, signal change, and signal loss values extracted from the potential-corrected SWVs* ***at 40 and 160Hz****. (VA=vancomycin, BG=PBS before VA measurement, BGA=PBS after VA measurement).*

		160 Hz					40 Hz				
	Sensor #	Forward peak current (µA)			Signal change	Signal loss	Forward peak current (µA)			Signal change	Signal loss
		BG	VA	BGA			BG	VA	BGA		
Direct noncovalent	1	26.78	19.27	22.80	28%	15%	0.523	0.495	0.462	5%	12%
	2	32.01	24.15	28.48	25%	11%	0.846	0.697	0.721	18%	15%
	3	22.89	18.19	18.79	21%	18%	0.473	0.443	0.429	6%	9%
	Mean	27.2±3.7	20.5±2.6	23.0±4.1	**25±3%**	**15±3%**	0.61±0.17	0.55±0.11	0.54±0.13	**10±6%**	**12±2%**
Direct covalent	1	27.26	20.28	23.62	26%	13%	0.485	0.467	0.418	4%	14%
	2	27.98	23.20	26.12	17%	7%	0.742	0.607	0.634	18%	14%
	3	22.22	16.05	18.75	28%	16%	0.555	0.447	0.450	19%	19%
	Mean	25.8±2.6	19.8±2.9	22.8±3.1	**24±5%**	**12±4%**	0.59±0.11	0.51±0.07	0.50±0.10	**14±7%**	**16±2%**
Linker LbL	1	27.17	18.78	22.74	31%	16%	0.434	0.395	0.374	9%	14%
	2	37.90	31.11	33.73	18%	11%	0.927	0.672	0.763	28%	18%
	3	25.03	19.37	22.63	23%	10%	0.647	0.570	0.574	12%	11%
	Mean	30.0±5.6	23.1±5.7	26.4±5.2	**24±5%**	**12±3%**	0.67±0.20	0.55±0.11	0.57±0.16	**16±8%**	**14±3%**
Linker Premix	1	30.52	23.70	27.47	22%	10%	0.570	0.469	0.474	18%	17%
	2	31.96	25.37	29.01	21%	9%	0.969	0.736	0.820	24%	15%
	3	19.28	15.60	17.80	19%	8%	0.582	0.497	0.524	15%	10%
	Mean	27.3±5.7	21.6±4.3	24.8±5.0	**21±1%**	**9±1%**	0.71±0.19	0.57±0.12	0.61±0.15	**19±4%**	**14±3%**

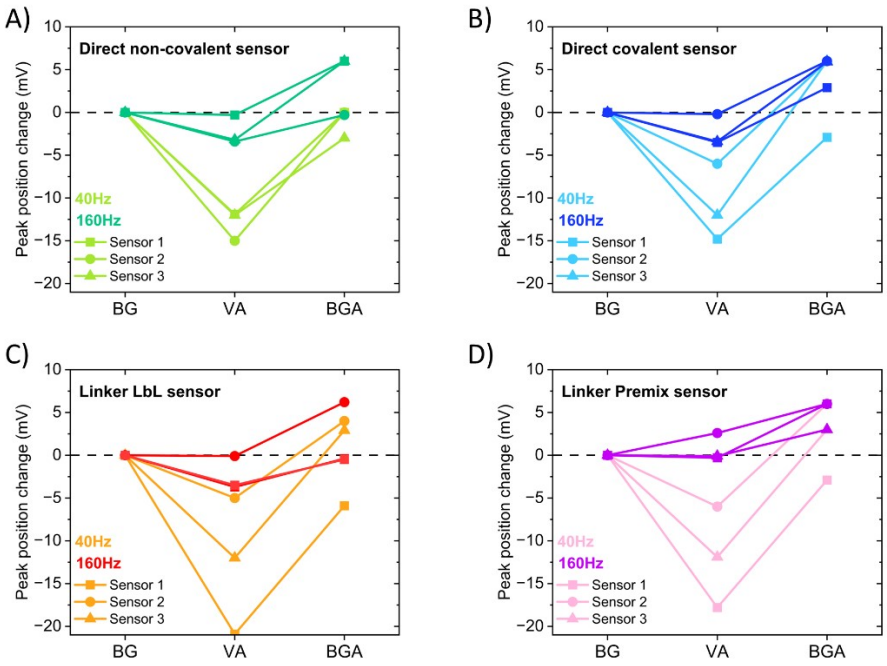

Figure SI4. *Peak shifts of the forward partial currents at 40 and 160Hz of the four aptamer immobilization approaches. Three sensors were measured for each aptamer immobilization approach. (VA=vancomycin, BG=PBS before VA measurement, BGA=PBS after VA measurement).*

Stability and repeatability study

Table SI3. *Signal loss after each measurement of saturating concentration of vancomycin for Direct non-covalent and Linker LbL sensors prepared with different cleaning methods. The total signal loss after the three vancomycin measurements is also presented.*

	Signal loss %							
	Direct non-covalent sensors				Linker LbL sensors			
	No cleaning		GuHCl cleaning		VA bath cleaning		GuHCl cleaning	
	40 Hz	2000 Hz	40 Hz	2000 Hz	40 Hz	2000 Hz	40 Hz	2000 Hz
After 1st VA measurement	24.5±5.6	14.8±3.6	11.8±2.9	10.1±1.9	6.3±13.8	8.2±2.2	15.7±3.2	8.2±1.9
After 2nd VA measurement	6.5±1.5	5.2±1.1	2.9±0.3	2.7±1.0	15.5±6.8	11.2±5.6	1.4±2.7	3.5±2.2
After 3rd VA measurement	8.0±5.9	7.1±5.0	4.1±1.0	2.6±1.2	10.3±6.4	7.2±5.7	6.0±3.9	2.8±3.2
Total loss	34.7±9.5	24.8±7.3	19.2±4.1	27.3±1.9	29.5±9.5	24.1±10.0	21.7±6.9	13.8±5.9

Basic electrochemistry of plain SWCNT

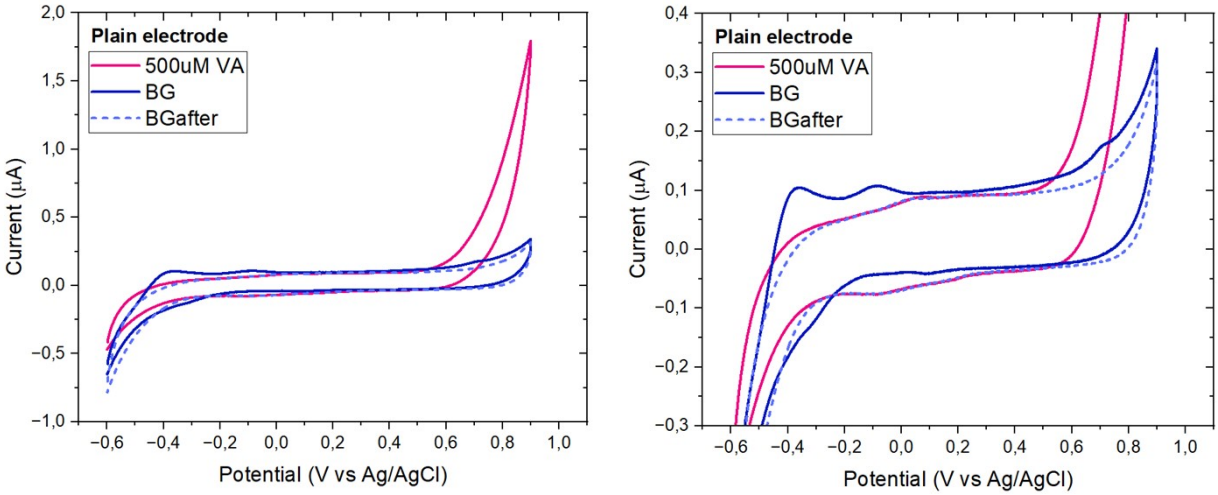

Figure SI5. *Cyclic Voltammetry of a plain electrode in PBS before (BG) and after (BGafter) the measurement of 500uM VA.*

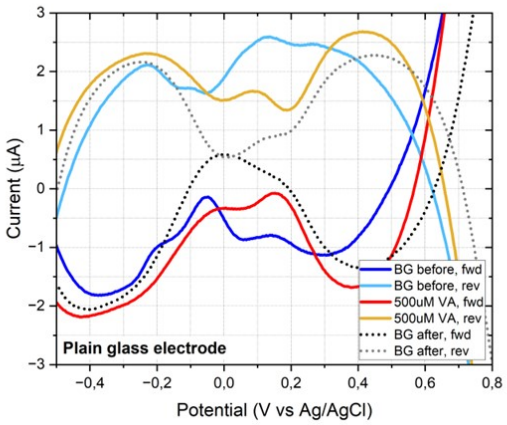

Figure SI6*. SWV of a plain electrode in PBS before (BG) and after (BGafter) the measurement of 500uM VA.*

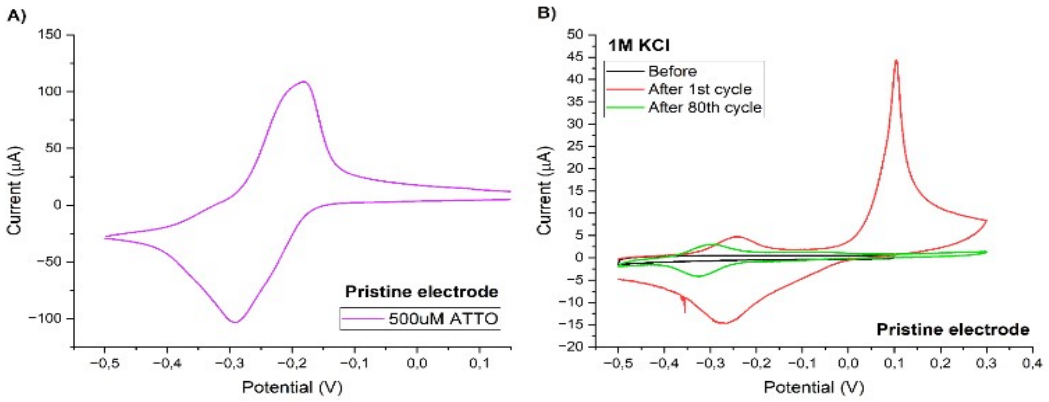

Figure SI7*. CV at 1V/s of a plain electrode in A) 500uM ATTO-MB2 and B) 1M KCl before and after the ATTO-MB2 measurement.*

Concentration series

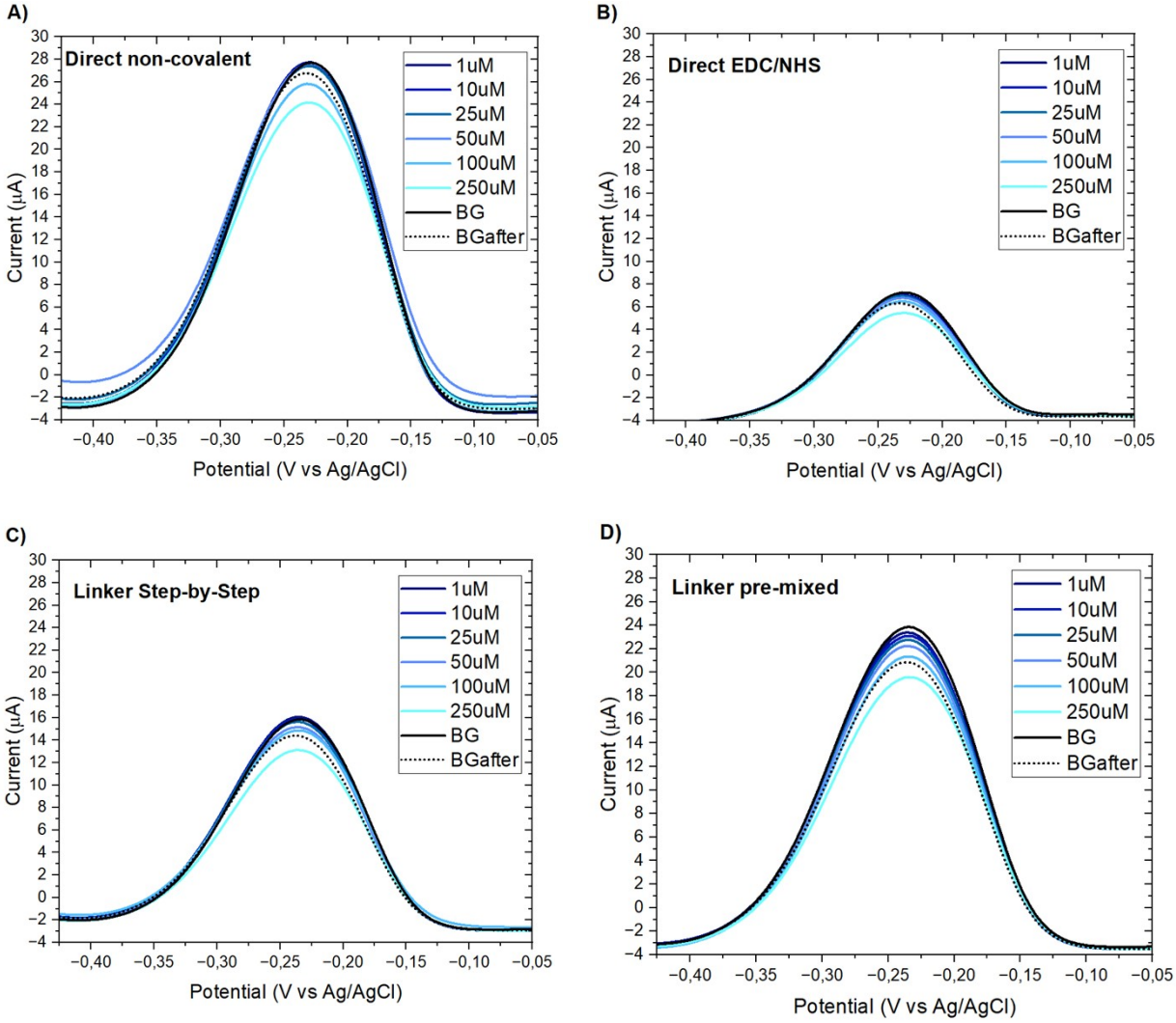

***Figure SI8**. Potential-corrected forward SWVs at 160Hz of 1, 10, 25, 50, 100, and 250uM VA solutions of A) Direct non-covalent, B) Direct EDC/NHS, C) Linker step-by-step, and D) Linker pre-mixed electrodes.*

***Table SI4.** Shift in the position of the oxidation peak due to vancomycin of the four different sensors.*

PEAK SHIFT (mV)													
	Direct non-covalent			Direct EDC/NHS				Linker Step-by-step			Linker Pre-mixed		
Sample #	1	2	3	1	2	3	4	1	2	3	1	2	3
BG-BGafter	2.9	3	2.7	6	2.9	2.8	2.7	2.9	4.5	-0.2	0.1	1.5	1.7
BG-1uM	-0.2	0	3.1	3.1	0	0	-0.2	0	3	-2.1	0	-1.5	0
BG-10uM	3.2	-0.2	3.1	3	0	-0.1	-0.3	3.2	3	-0.1	0	-1.6	-0.2
BG-25uM	-0.3	-0.2	3	3	-0.1	-0.1	2.9	-0.1	2.9	-0.2	0	-1.7	-0.1
BG-50uM	-0.3	3.1	2.9	3	-0.1	-0.1	2.8	-0.1	2.8	-0.2	-0.2	-0.9	1.7
BG-100uM	1.3	-0.3	-0.7	2.9	-0.1	-0.2	2.8	-0.1	2.8	-0.2	-0.2	-1.8	1.7
BG-250uM	2.9	-0.3	2.6	2.9	-0.3	-0.2	-0.5	3.1	1.2	-3.3	-0.1	-1.8	-0.2