Graphene oxide-Au nano particle coated quartz crystal microbalance biosensor for the real time analysis of carcinoembryonic antigen

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Supportive Data

Table S1: Comparative results of actual and experimental estimation of mass deposition of CEA in each immunoassay run.

The concentration of CEA stock solution (ng/ml)	Experimental value without O_2 plasma (ng)	Experimental value with O_2 plasma (ng)	Theoretically calculated Value in (ng)
0.1	0.12±0.4	0.13±0.4	0.15
1	1.11±0.4	1.230.4	1.5
10	14.23±2.35	14.45±2.16	15
20	28.54±3.65	28.95±3.85	30
40	57.48±4.5	57.68±4.1	60
60	85.89±6.58	86.46±5.76	90

80	115.65±8.85	115.55±8.22	120
100	144.76±10.75	145.76±8.78	150
120	172.68±12.89	174.76±10.64	180

Table S2: Sensitivity reported by various piezoelectric studies for CEA detection

Study	Sensitivity	Method
S. Li et al [25]	37 pg/ml	Love wave
Chen et al [14]	5 ng/ml	QCM
Zheng et al [27]	0.2 mg/mL	Bulk Acoustic resonator
Zhang [28]	1 ng/ml	SAW
Present Work	0.33 ng/ml	QCM

Table S3: Combination of various tumor marking proteins

Alpha-1-fetoprotein (AFP) (ng/ml)	Cancer antigen 125 (CA125) (ng/ml)	L-tryptophan (ng/ml)	Carcinoembryonic antigen (CEA) (ng/ml)
0	1	0	1
1	0	0	1
0	0	1	1
0	0	0	1

Table S4: Steady-state fractional coverage of gold surface for each concentration of anti-CEA

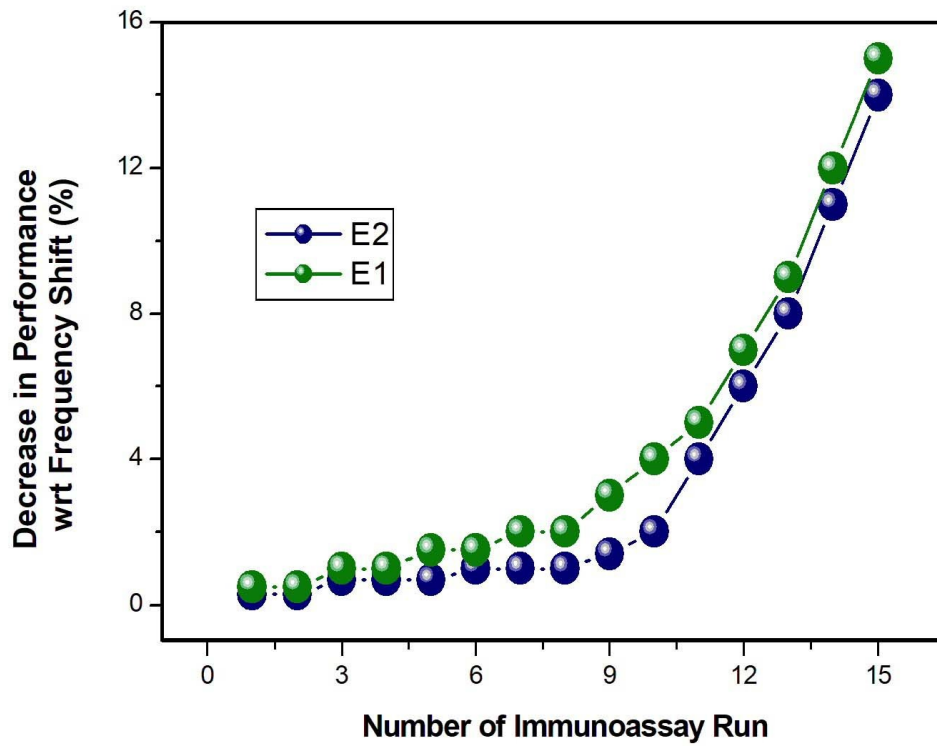| anti-CEA concentration (µg/mL)	E2	E1
50	0.86±0.06	0.71±0.04
75	0.88±0.06	0.73±0.05
100	0.89±0.04	0.75±0.08
125	0.89±0.07	0.75±0.09

Figure S1: Reproducibility in results of biosensors E1 and E2