Supplementary data to:

Application of Box-Behnken design in the optimization of a simple graphene oxide/zinc oxide nanocomposite based pipette tip micro solid phase extraction for the determination of Rhodamine B and Malachite green in seawater samples by spectrophotometry

Sayyed Hossein Hashemi,*[a] Massoud Kaykhaii [b] Ahmad Jamali Keikha [c] and Asmeh Parkaz [a]

[a.] Department of Marine Chemistry, Faculty of Marine Science, Chabahar Maritime University, Chabahar, Iran. Email: h_hashemi_85@yahoo.com

[b.] Department of Chemistry, Faculty of Sciences, University of Sistan and Baluchestan, Zahedan, Iran.

[c.] Department of Mechanical Engineering, Faculty of Marine Engineering, Chabahar Maritime University, Chabahar, Iran.

Table SI1. The Box-Behnken design for the optimization of GO/ZnO PT-µSPE

A	B	C	D	E	F	G	Y (MG)observed	Y (MG)predicted	Error (MG)	Percent (MG)	Y (RhB)observed	Y (RhB)predicted	Error (RhB)	Percent (RhB)
-1	-1	0	0	0	-1	0	0.59	0.54	0.05	8.08	0.53	0.51	0.02	4.17
-1	-1	0	0	0	+1	0	0.59	0.52	0.07	12.39	0.55	0.60	-0.05	-9.22
-1	0	-1	0	0	0	-1	0.48	0.55	-0.07	-15.62	0.52	0.51	0.01	1.67
-1	0	-1	0	0	0	+1	0.61	0.62	-0.01	-1.73	0.54	0.55	-0.005	-0.94
-1	0	0	-1	-1	0	0	0.54	0.53	0.01	2.36	0.50	0.48	0.02	4.08
-1	0	0	-1	+1	0	0	0.58	0.55	0.03	5.07	0.48	0.47	0.01	1.76
-1	0	0	+1	-1	0	0	0.59	0.56	0.03	4.90	0.49	0.46	0.03	6.45
-1	0	0	+1	+1	0	0	0.58	0.55	0.02	4.32	0.45	0.44	0.01	1.97
-1	0	+1	0	0	0	-1	0.64	0.60	0.04	6.76	0.51	0.52	-0.01	-2.92
-1	0	+1	0	0	0	+1	0.48	0.51	-0.03	-5.93	0.65	0.62	0.03	4.64
-1	+1	0	0	0	-1	0	0.46	0.53	-0.07	-14.47	0.52	0.52	-0.004	-0.85
-1	+1	0	0	0	+1	0	0.39	0.47	-0.08	-20.64	0.53	0.60	-0.07	-12.54
0	-1	-1	-1	0	0	0	0.65	0.69	-0.03	-5.17	0.63	0.61	0.01	2.36
0	-1	-1	+1	0	0	0	0.64	0.68	-0.04	-5.98	0.61	0.58	0.03	5.37
0	-1	0	0	-1	0	-1	0.63	0.65	-0.02	-3.56	0.58	0.59	-0.01	-1.71
0	-1	0	0	+1	0	-1	0.62	0.65	-0.03	-4.80	0.55	0.56	-0.01	-2.33
0	-1	0	0	-1	0	+1	0.63	0.65	-0.02	-3.17	0.59	0.63	-0.04	-6.31
0	-1	0	0	+1	0	+1	0.62	0.64	-0.02	-3.68	0.58	0.60	-0.02	-3.75
0	-1	+1	-1	0	0	0	0.66	0.72	-0.05	-8.07	0.64	0.64	0.00	0.04
0	-1	+1	+1	0	0	0	0.66	0.70	-0.05	-7.31	0.60	0.62	-0.01	-2.29
0	0	-1	0	-1	-1	0	0.71	0.70	0.01	1.58	0.58	0.57	0.01	1.74
0	0	-1	0	+1	-1	0	0.70	0.70	0.004	0.56	0.57	0.54	0.03	5.08
0	0	-1	0	-1	+1	0	0.71	0.69	0.02	3.56	0.59	0.64	-0.05	-9.28
0	0	-1	0	+1	+1	0	0.72	0.69	0.03	4.17	0.58	0.62	-0.04	-7.35
0	0	0	-1	0	-1	-1	0.79	0.78	0.01	1.17	0.41	0.46	-0.05	-11.84
0	0	0	+1	0	-1	-1	0.77	0.75	0.02	2.30	0.37	0.42	-0.05	-13.52
0	0	0	-1	0	-1	+1	0.78	0.76	0.02	2.97	0.43	0.48	-0.05	-11.10
0	0	0	+1	0	-1	+1	0.72	0.72	0.002	0.30	0.40	0.46	-0.05	-13.39
0	0	0	0	0	0	0	0.92	0.90	0.02	2.71	0.84	0.86	-0.02	-2.35
0	0	0	0	0	0	0	0.95	0.90	0.05	5.37	0.95	0.86	0.09	9.61
0	0	0	0	0	0	0	0.83	0.90	-0.06	-7.54	0.97	0.86	0.11	11.11
0	0	0	0	0	0	0	0.93	0.90	0.03	3.02	0.82	0.86	-0.03	-4.21
0	0	0	0	0	0	0	0.82	0.90	-0.08	-9.78	0.89	0.86	0.03	3.52
0	0	0	0	0	0	0	0.94	0.90	0.04	4.16	0.71	0.86	-0.15	-20.94
0	0	0	-1	0	+1	-1	0.71	0.71	-0.002	-0.31	0.59	0.52	0.07	11.81
0	0	0	+1	0	+1	-1	0.69	0.71	-0.02	-3.36	0.55	0.50	0.05	9.99
0	0	0	-1	0	+1	+1	0.74	0.76	-0.02	-2.39	0.62	0.55	0.07	11.91
0	0	0	+1	0	+1	+1	0.74	0.75	-0.01	-1.25	0.61	0.54	0.06	10.59
0	0	+1	0	-1	-1	0	0.67	0.70	-0.03	-4.46	0.63	0.59	0.04	6.84
0	0	+1	0	+1	-1	0	0.66	0.68	-0.02	-3.84	0.60	0.55	0.05	8.49
0	0	+1	0	-1	+1	0	0.67	0.67	-0.004	-0.59	0.65	0.69	-0.03	-5.35
0	0	+1	0	+1	+1	0	0.65	0.66	-0.01	-1.72	0.64	0.65	-0.01	-1.77
0	+1	-1	-1	0	0	0	0.80	0.75	0.05	6.01	0.65	0.64	0.01	2.23
0	+1	-1	+1	0	0	0	0.78	0.73	0.05	6.86	0.60	0.60	0.00	-0.04
0	+1	0	0	-1	0	-1	0.68	0.66	0.02	3.36	0.63	0.61	0.02	3.61
0	+1	0	0	+1	0	-1	0.67	0.65	0.02	2.98	0.61	0.58	0.04	5.93
0	+1	0	0	-1	0	+1	0.71	0.68	0.03	4.20	0.66	0.65	0.01	2.28
0	+1	0	0	+1	0	+1	0.69	0.67	0.02	3.25	0.62	0.61	0.01	1.68
0	+1	+1	-1	0	0	0	0.73	0.70	0.04	5.20	0.61	0.64	-0.03	-5.67
0	+1	+1	+1	0	0	0	0.70	0.67	0.03	4.79	0.60	0.62	-0.01	-2.42
+1	-1	0	0	0	-1	0	0.49	0.41	0.08	16.26	0.33	0.29	0.04	11.15
+1	-1	0	0	0	+1	0	0.50	0.43	0.07	13.32	0.35	0.35	0.003	0.85
+1	0	-1	0	0	0	-1	0.48	0.45	0.03	5.90	0.31	0.33	-0.01	-4.87
+1	0	-1	0	0	0	+1	0.51	0.56	-0.04	-8.41	0.32	0.31	0.01	2.84
+1	0	0	-1	-1	0	0	0.49	0.52	-0.02	-5.07	0.28	0.29	-0.01	-2.01
+1	0	0	-1	+1	0	0	0.48	0.51	-0.03	-5.99	0.25	0.27	-0.02	-6.90
+1	0	0	+1	-1	0	0	0.45	0.48	-0.03	-6.54	0.27	0.28	-0.005	-1.80
+1	0	0	+1	+1	0	0	0.43	0.44	-0.01	-2.96	0.25	0.26	-0.01	-4.26
+1	0	+1	0	0	0	-1	0.55	0.54	0.01	1.92	0.31	0.31	0.003	0.93
+1	0	+1	0	0	0	+1	0.56	0.48	0.07	13.30	0.32	0.33	-0.005	-1.70
+1	+1	0	0	0	-1	0	0.42	0.49	-0.07	-17.56	0.34	0.31	0.03	8.44
+1	+1	0	0	0	+1	0	0.43	0.48	-0.05	-11.08	0.34	0.35	-0.01	-4.35

Table SI2. ANOVA analysis for preconcentration of dyes

Source	Sum of Squares	Degree of freedom	Mean Square	F Value	p-value Prob > F	% PC
For MG						
Model	0.99	35	0.028	7.32	< 0.0001	
A-pH	0.022	1	0.022	5.67	0.025	1.69
B	0.0012	1	0.0012	0.32	0.58	0.092
C	0.0010	1	0.0010	0.27	0.60	0.077
D	0.0018	1	0.0018	0.48	0.50	0.14
E	0.00027	1	0.00027	0.069	0.79	0.021
F	0.0021	1	0.0021	0.54	0.47	0.16
G	0.00034	1	0.00034	0.089	0.77	0.026
AB	0.0045	1	0.0045	1.17	0.29	0.34
AC	0.00090	1	0.00090	0.23	0.63	0.069
AD	0.0023	1	0.0023	0.59	0.45	0.18
AE	0.00046	1	0.00046	0.12	0.73	0.035
AF	0.0008	1	0.0008	0.21	0.65	0.061
AG	0.00067	1	0.00067	0.17	0.68	0.051
BC	0.0034	1	0.0034	0.89	0.35	0.26
BD	0.00011	1	0.00011	0.029	0.87	0.0084
BE	1.01E-05	1	1.01E-05	0.0026	0.96	0.00077
BF	0.000612	1	0.00061	0.16	0.69	0.047
BG	0.00028	1	0.00028	0.072	0.79	0.021
CD	4.5E-06	1	4.5E-06	0.0012	0.97	0.00034
CE	7.2E-05	1	7.2E-05	0.019	0.89	0.0055
CF	0.00011	1	0.00011	0.029	0.87	0.0084
CG	0.013	1	0.013	3.30	0.081	1.00
DE	0.00043	1	0.00043	0.11	0.74	0.033
DF	0.00043	1	0.00043	0.11	0.74	0.033
DG	9.11E-05	1	9.11E-05	0.024	0.88	0.0070
EF	3.2E-05	1	3.2E-05	0.0083	0.93	0.0024
EG	6.12E-06	1	6.12E-06	0.0016	0.97	0.00047
FG	0.0025	1	0.0025	0.64	0.43	0.19
A^2	0.85	1	0.85	220.16	< 0.0001	65.16
B^2	0.13	1	0.13	33.98	< 0.0001	9.97
C^2	0.042	1	0.042	11.029	0.0027	3.22
D^2	0.021	1	0.021	5.51	0.027	1.61
E^2	0.11	1	0.11	28.88	< 0.0001	8.43
F^2	0.055	1	0.055	14.29	0.0008	4.22
G^2	0.037	1	0.037	9.70	0.0045	2.84
Residual	0.10	26	0.0038			
Lack of Fit	0.084	21	0.0040	1.26	0.43	
Pure Error	0.016	5	0.0032			
Cor Total	1.088	61				
For RhB						
Model	5.95	35	0.17	15.00	< 0.0001	
A	1.73	1	1.73	152.61	< 0.0001	24.20
B	0.0028	1	0.0028	0.25	0.62	0.039
C	0.0086	1	0.0086	0.76	0.39	0.12
D	0.014	1	0.014	1.28	0.27	0.20
E	0.015	1	0.015	1.32	0.26	0.21
F	0.132	1	0.13	11.68	0.0021	1.85
G	0.025	1	0.025	2.19	0.15	0.35
AB	0.00011	1	0.00011	0.0098	0.92	0.0015
AC	0.0030	1	0.0030	0.26	0.61	0.042
AD	0.00011	1	0.00011	0.0097	0.92	0.0015
AE	0.00077	1	0.00077	0.068	0.80	0.011
AF	3.15E-05	1	3.15E-05	0.0028	0.96	0.00044
AG	0.0071	1	0.0071	0.62	0.44	0.099
BC	0.00065	1	0.00065	0.057	0.81	0.0091
BD	1.03E-06	1	1.03E-06	9.1E-05	0.99	1.44E-05
BE	4.86E-05	1	4.86E-05	0.0043	0.95	0.00068
BF	0.00050	1	0.00050	0.044	0.83	0.0070
BG	3.18E-05	1	3.18E-05	0.0028	0.96	0.00044
CD	0.0001	1	0.0001	0.0088	0.93	0.0014
CE	0.00020	1	0.00020	0.017	0.90	0.0028
CF	0.00081	1	0.00081	0.072	0.79	0.011
CG	0.0043	1	0.0043	0.38	0.54	0.060
DE	2.33E-05	1	2.33E-05	0.0021	0.96	0.00033

DF	0.00063	1	0.00063	0.056	0.81	0.0088
DG	0.0013	1	0.0013	0.11	0.74	0.0182
EF	9.15E-05	1	9.15E-05	0.0081	0.93	0.0013
EG	4.49E-06	1	4.49E-06	0.00040	0.98	6.28E-05
FG	6.31E-05	1	6.31E-05	0.0056	0.94	0.00088
A^2	3.42	1	3.42	301.46	< 0.0001	47.77
B^2	0.026	1	0.026	2.33	0.14	0.36
C^2	0.031	1	0.031	2.77	0.11	0.43
D^2	0.75	1	0.75	66.63	< 0.0001	10.49
E^2	0.28	1	0.28	24.42	< 0.0001	3.92
F^2	0.33	1	0.33	29.39	< 0.0001	4.61
G^2	0.37	1	0.37	33.02	< 0.0001	5.17
Residual	0.29	26	0.011			
Lack of Fit	0.23	21	0.011	0.86	0.64	
Pure Error	0.064	5	0.013			