Development of a Microfluidic Paper Analytical Device for the Measurement of Iodide in Briny Wastewater

Supplemental Information

I. Optimization of Sulfuric Acid Concentration

In order to determine the optimal sulfuric acid concentration, we compared the sensitivity (slope of the calibration curve) and linearity (R^2 value) as by running the assay with different acid concentrations. The data is show below in table 1. The information is reported as sulfuric acid concentration on chip once everything is combined with the sample.

Concentration on μPAD (M)	R^2	slope
0.563	0.952	0.0077
0.750	0.967	0.0107
0.844	0.955	0.0113
1.125	0.978	0.0164

Table 1. Different sulfuric acid concentrations and the impact on linearity and sensitivity. The highest linearity and sensitivity were recorded for 1.125 M sulfuric acid on the μPAD.

II. Additional Interference Testing

In addition to the experiments described in the paper, we also measured the possible impact of chloride and bromide present in the sample matrix in two additional ways. The first added chloride or bromide individually to standards made with iodide between 0 and 35 ppm. Line one of table 2 has not interferences while line 2 and 3 have either bromide or chloride. The addition of bromide or chloride and no significant impact on the sensitivity or linearity.

Concentration of Br^-	Concentration of Cl^-	Sensitivity	Linearity
0	0	0.0272	0.9695
300	0	0.0265	0.9816
0	17600	0.0226	0.9666

Table 2 High concentrations of bromine and chlorine impact on iodide calibration curve (0-32.1 I^- ppm)

We also followed this experiment by measuring calibration curves at varying concentrations of either chloride or bromide. Again, even at the highest likely concentrations of bromide or chloride, we saw no significant interference.

Concentration of Br^- (ppm)	Concentration of Cl^- (ppm)	Sensitivity	Linearity
0	13600	0.0242	0.9774
0	16000	0.027	0.9759
0	17600	0.0226	0.9666
0	20000	0.0265	0.9798
0	24000	0.0261	0.9259
300	0	0.0265	0.9816
600	0	0.0271	0.9771
900	0	0.0309	0.9692
1200	0	0.0278	0.9891
1500	0	0.0274	0.9889

Table 3. Impact of varying bromine and chlorine concentrations on the calibration curve (0-32.1 ppm I^-)

III. Long Term stability Testing

In order to be able to ensure that the chips could be produced and then used successfully at a later date, a calibration curve was produced periodically over a 90-day period. The data is presented below for days 47 through 90. The sensitivity (slope of the calibration curve) and linearity (R2) are tracked to insure analytical performance over time.

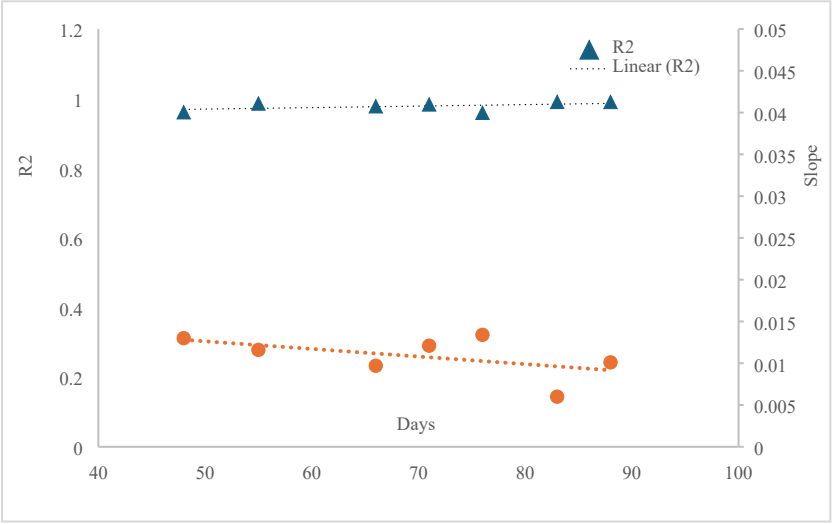

Figure 1. Sensitivity and selectivity of µPAD pre-treated with starch over time. Devices were stored in dark room temperature conditions and retain high sensitivity and selectivity for up to 85 days.

VI. Printing Template for Chips

Note: The backside of the chips is either yellow or black printed ink This is formatted for an 8.5 x 11 paper in landscape orientation.