Pitch Lake Test 1

General

Samples were collected from the Pitch Lake, La Brea on June 6th 2022.
It rained heavily for 4 days before the trip, in accordance with a tropical wave.

Three Samples were collected:

'High Sulfur' - Collected from a pool on the outer area of the lake which had a large, visible amount of sulfur deposited. G. sulfurreducens has been known to produce good results with MFC so this was an interesting sample.

'Lake' - Collected from the interior of the lake, in spots popular for sulfur spring bathing as such the sulfur content is present but not highly concentrated.

'Pump' - Collected from the outflow of the lake's pump which collects all the water from the lake's surface such that the asphalt can be mined. This as a result is a combination of all the waters collected on the lake.

Set up

The samples were held on ice during transportation and places into a DCMFC, each chamber measuring 30ml, with Nafion XL (product discontinued) as the membrane using distilled water as the catholyte. The cells were connected in an open cell configuration so as to gauge the viability of the source water before measuring power output.

Data was collected over a period of approx. **92.5 hours** (~4 days)

Cathodes used were:

The cathodes used were aluminum mesh (chicken wire) and measures: **14.5cm** $\times$ **10.5cm** which were rolled into a loose spiral.

Anodes used were:

20% PtC paper for the High Sulfur and Pump samples
40% PtC paper for the Lake sample

This decision was made due to the availability of anode materials and the assessment that the lake sample appeared to be the weakest upon visual inspection.

All anodes measured **5cm** $\times$ **5cm**.

COD

COD measurements were taken using HACH HR+ reagents and the DR3900 spectrometer.

Initial COD readings for the collected samples are as follows. All readings are given in **mg/L**

Sample	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Average	Error in the mean
High Sulfur	345	342	343	343	344	343.4	1.4
Lake	53	54	48	49	50	50.8	2.6
Pump	50	39	38	42	45	42.8	7.5

The final readings were:

Sample	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Average	Error in the mean
High Sulfur	310	316	318	314	313	314.2	3.0
Lake	26	27	28	20	23	24.8	3.3
Pump	31	24	34	35	32	31.2	4.3

From this we note that all samples experience some change in metabolic activity which can be represented as a percentage decrease:

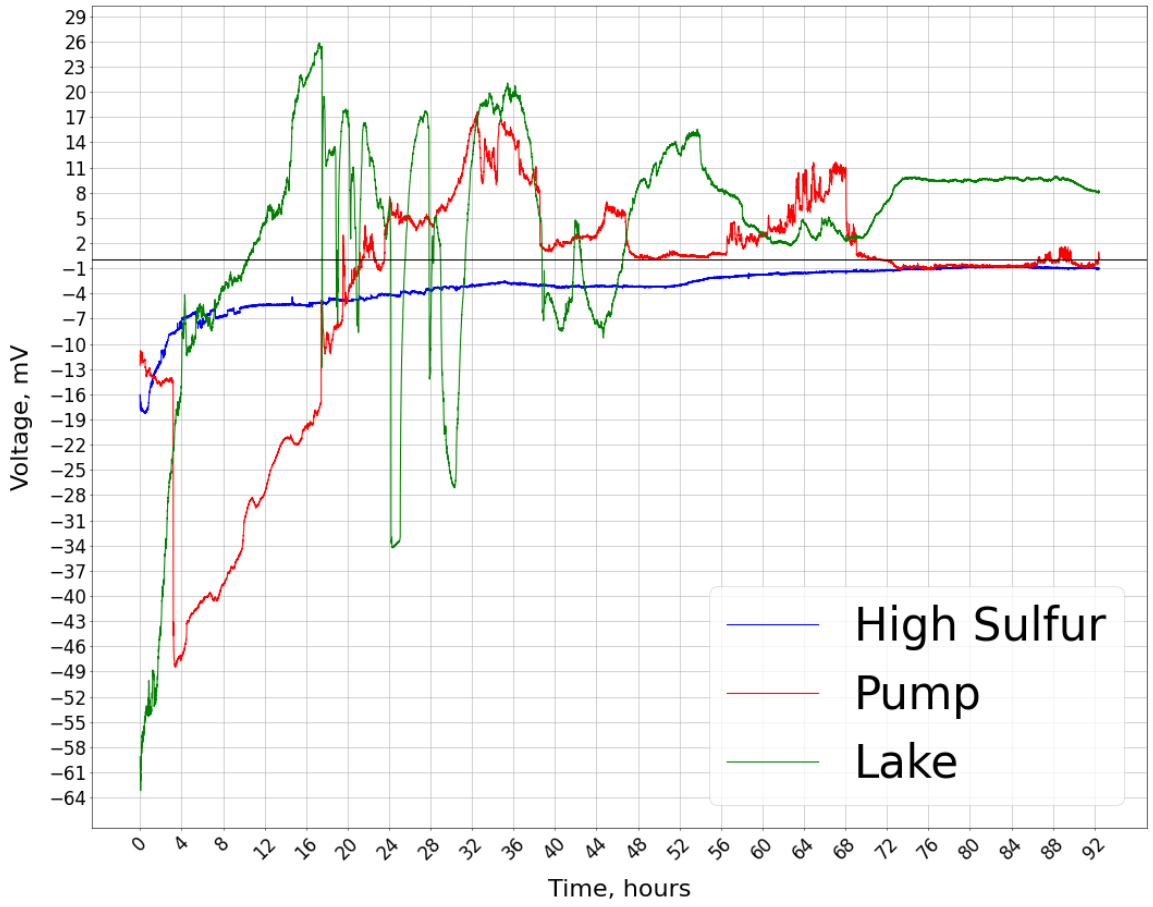
Sample	% decrease	Error
High Sulfur	8.5	1.0
Lake	51.2	8.7
Pump	27.1	20.7

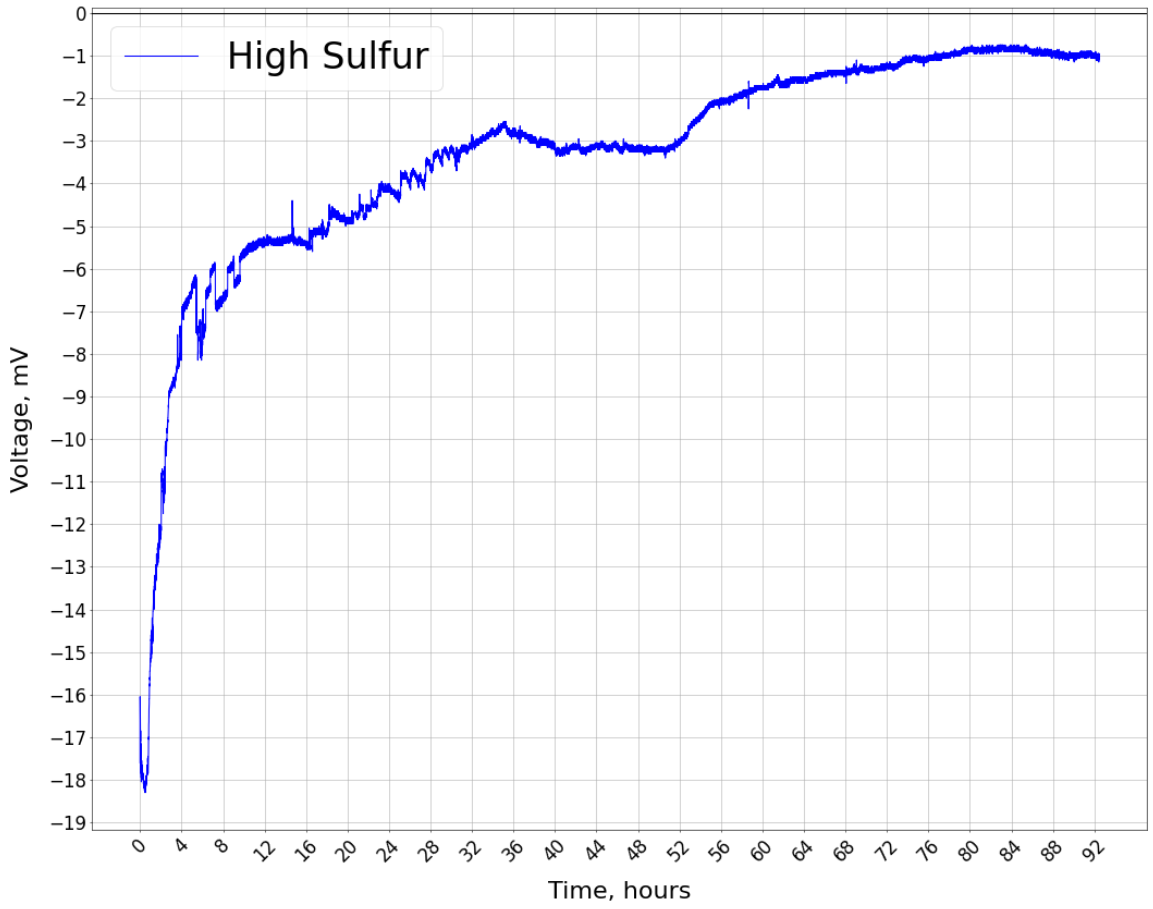
This tell us that the data collected from the Pump sample should be viewed as imprecise. But also that the Lake sample had the most metabolic change, which coincides with the results

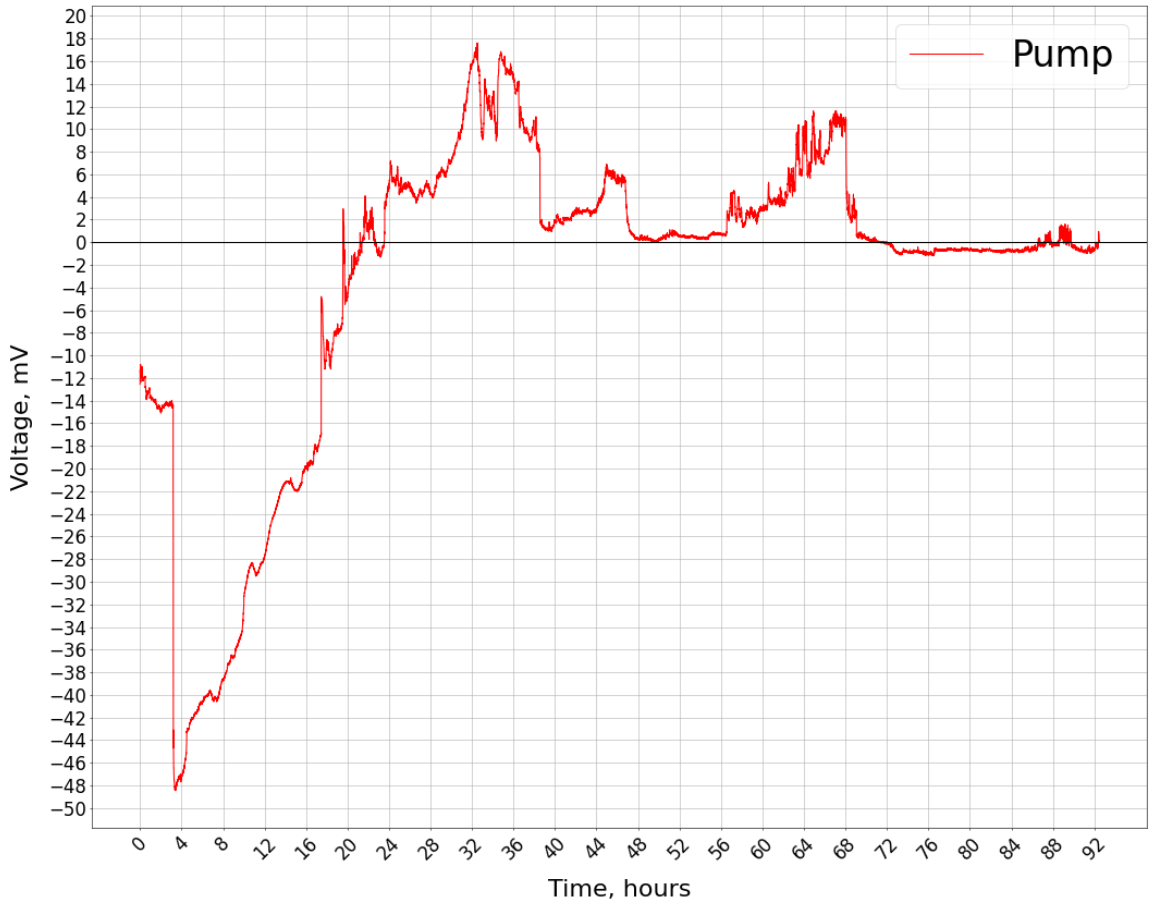
shown below. Similarly the High Sulfur sample had the least change which is also reflected below.

Bioelectricity

Below are the voltage-time curves for the three samples:




High Sulfur
Voltage, mV
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
−10
−11
−12
−13
−14
−15
−16
−17
−18
−19
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
Time, hours


Pump
Voltage, mV
Time, hours
20
18
16
14
12
10
8
6
4
2
0
−2
−4
−6
−8
−10
−12
−14
−16
−18
−20
−22
−24
−26
−28
−30
−32
−34
−36
−38
−40
−42
−44
−46
−48
−50
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92


Lake
Voltage, mV
26
23
20
17
14
11
8
5
2
−1
−4
−7
−10
−13
−16
−19
−22
−25
−28
−31
−34
−37
−40
−43
−46
−49
−52
−55
−58
−61
−64
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
Time, hours