Study of Rare Earth Element Uptake in Seaweed from Mining Water

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Introduction

-Wastewater treatment processes are costly and require large amounts of energy, neglecting the recovery of valuable materials. This research continues investigating the use of **Gracilaria** and **Sargassum** and their production of **agarose** and **alginate**, respectively, as biofilters for extracting rare earth elements **(REEs)** from mining water and different concentrations of elements.
-Agarose applications are well-established and replicable, while alginate is less well-known and requires more experimental replicates for copper adhesion. Sargassum, which produces alginate, is more present on Puerto Rico beaches compared to Gracilaria, which produces agarose.

Experimental Approach

1) Dissolve agarose in DMSO to create a 2 wt.% solution.
2) Spin coat solution onto the silicon wafer.
3) Heat the wafer.
4) Expose the wafer to E1 and J1 mining water solutions.
5) Analyze mining water effects with GD-OES analysis.

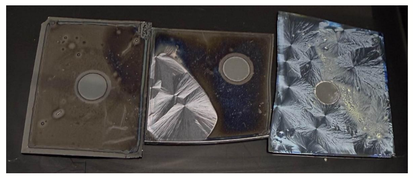

Figure 1: 80, 800, 8000ppm spin coated agarose

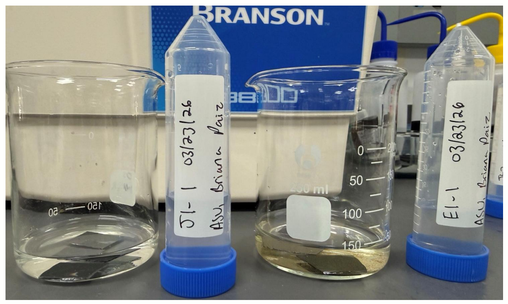

Figure 2: E-1 J-1 mining water exposures

Results

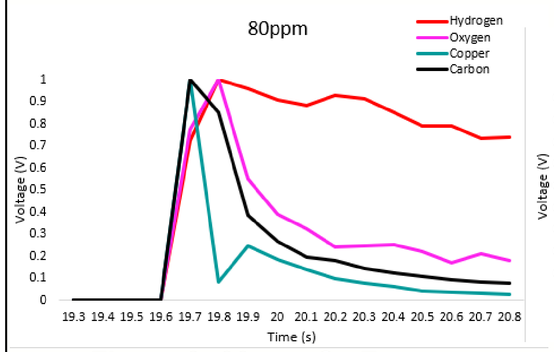

Figure 3: 80ppm Cu Exposure

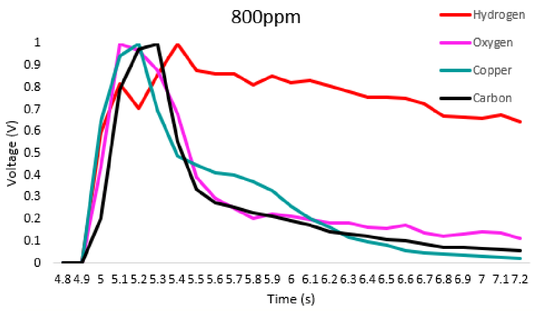

Figure 4: 800ppm Cu Exposure

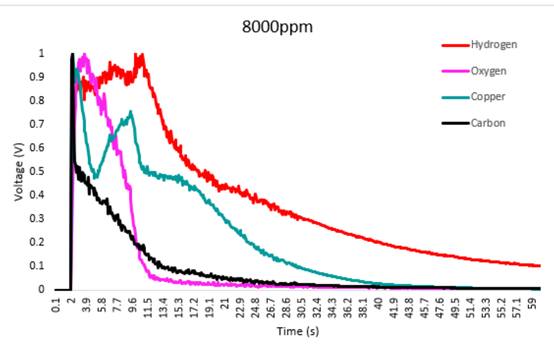

Figure 5: 8000ppm Cu Exposure

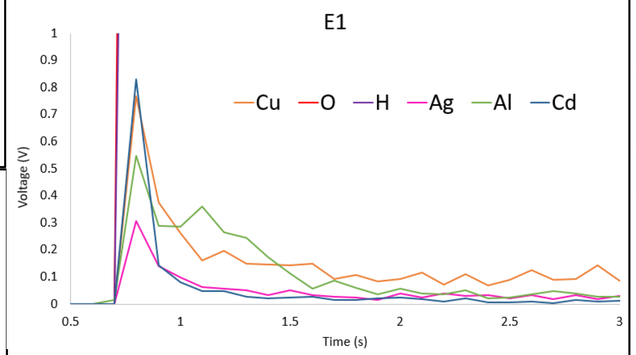

Figure 6: E1 Mining water Exposure

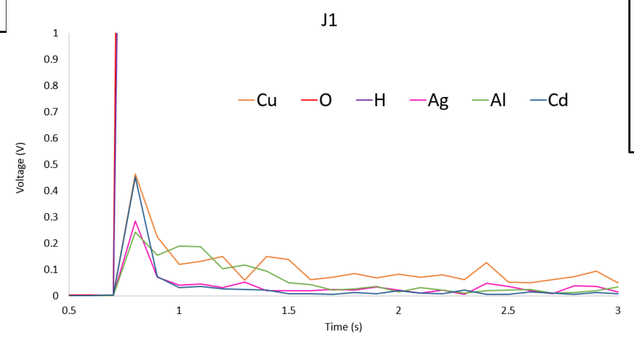

Figure 7: J1 Mining water Exposure

80, 800, 8000ppm copper explanation

-The 80, 800, and 8000ppm agarose copper exposure graphs are normalized from 0-1V for even distribution.
-Graphs confirm larger and longer uptake amounts of copper over time and with higher copper ppm amounts involved.

Mining water exposure explanation

-E1 and J1 had numerous REEs at different concentration amounts, of which copper and cadmium had the largest exposure.
-Data gathered is not completely in line with the concentrations given in the mining water itself, which suggests different rates of uptake.

Future Work

There are areas for continued research during my masters:
1) Analyzing alginate and mining water GD-OES data.
2) Agarose and alginate exposure to different elements.
3) Writing a literature paper on the experimental approach and data collected throughout the project.

FURI

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