CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

J1314

Project Title

Corrosion Rates of Differentiated Metals in Hyper Saline Environments

Abstract

Objectives

This project determined the corrosion rates of iron, steel, stainless steel, tungsten, copper, aluminum, zinc, graphite, and lead in a 5% saline environment.

Methods

Using sterilized jars, I measured out 100 mL of bottled water and added it to 36 jars. I used a triple beam balance to measure 0.5 grams of sea salt and added the salt to a jar of pre-measured water. I repeated this for 27 jars before confirming the salinity concentrations of each jar using a refractometer. I left 9 jars untreated for the controls. I measured and weighed each piece of metal before adding it to the jars to create three test trials and one control for each metal type. I then weighed and observed the metal and tested the salinity of the jars daily for two weeks and recorded observations, weights, and salinity in a journal. During the second week, I also tested the pH daily and recorded the results.

Results

Iron, copper, steel, zinc, aluminum, lead, and stainless steel changed in color as did their environments. Tungsten, steel, copper and lead increased in weight in all trials. Tungsten was the most corrosion resistant of the metals with only a slight weight change and color change. Copper and iron were the least corrosion resistant with significant color changes occurring rapidly, and they expelled the most debris into the water.

Conclusions

Tungsten, which is commonly used in construction of oil rigs and ships, was the least corrosive metal of the nine metals tested. Iron added the most debris to its environment through rust, and aluminum and zinc added a white debris to the environment, while copper turned the environment blue. The changes in the metal and the effects on the environment are important to note when industries create structures that must survive in the ocean from an environmental standpoint and from a fiscal standpoint. Industries should use the most resistant metals in order to create a product that will remain intact for years while also maintaining a sustainably low impact on the environment.

Summary Statement

Nine metals were observed and weighed in 5% salinity for two weeks supporting that the least corrosive, tungsten and lead, may be better for building ships and oil rigs than the most corrosive metals: iron, aluminum, copper and zinc.

Help Received

Greta Turney helped to acquire the materials for this project. Perrin Turney helped me to understand some chemistry behind corrosion and helped me design and modify my graphs. Jill Macknicki helped me create my backboard.