HOW DO IRON PYRITE CUBES RUST IN DIFFERENT LIQUIDS

The Effect of Different Liquids on the Rust of Iron Pyrite Cubes

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Question

Which liquid causes the greatest amount of rust on iron pyrite in 7 days?

Research

Iron is the most common material. Iron rusts because oxygen and water convert it into iron oxide.(Iron (Fe) - Melting Point, Atomic Mass & Number, Chemical and Physical Properties with Accessed 16 Oct. 2023.) But Iron can't rust without water("Why Can't Rust Form without Water?" *Chemistry Stack Exchange*, 6 Mar. 2015,), the sugar in fruit has much more nutrients then the refined sugar("Fruit Sugar vs. Refined Sugar: What's the Difference?" *Lifestyle Medicine Clinic*, 28 Apr. 2021,) .

Salt solution and electrolytes can make iron rust faster but sugar solution rusts iron slower because it is non-conductive.(*Ask an Expert: Nail Rusting*. Accessed 24 Oct. 2023. and *What Effect Does Salt Have on the Corrosion of Iron?(A) Absolutely None(B) Speeds up the Reaction(C) Stops Rusts in Its Track(D) Gives off a Different Type of Rust*. Accessed 24 Oct. 2023.).

Hypothesis

If iron pyrite cubes are soaked in salt water,then it would rust faster than other liquids.

Variables

- Independent variable: Different types of liquids
- Dependent variable: The amount of rust on each iron pyrite cubes
- Controlled variables (constants): Iron pyrite cubes, the amount of liquids in each cup

Risk Analysis

Maybe a kind of liquid that will turn dangerous after touching the iron rust.
wear gloves and safety goggles during the experiment.
Maybe a kind of liquid will explode after touching the iron rust.
Wear safety goggles and put the container away from the face.

Procedure

1. Label 3 cups of each of the five liquids(fresh water, vinegar, salt water, sugar water, orange juice)
2. Add 100 Ml of water to each cup labeled “water”
3. Repeat Step 2 for vinegar and orange juice
4. Mix 30g salt and 300mL water for salt water and do the same thing with sugar water
5. Pour 100 mL of the the mixture of step 3 into other 2 groups of 3 cups each (salt water for one group and sugar water for another)
6. Put similar iron pyrite in each group of cups
7. Place all the cups behind the coach, in the dining room
8. Check every day(7 days in total, excluding the setup day) and record the observations, fill in the data table on the final day

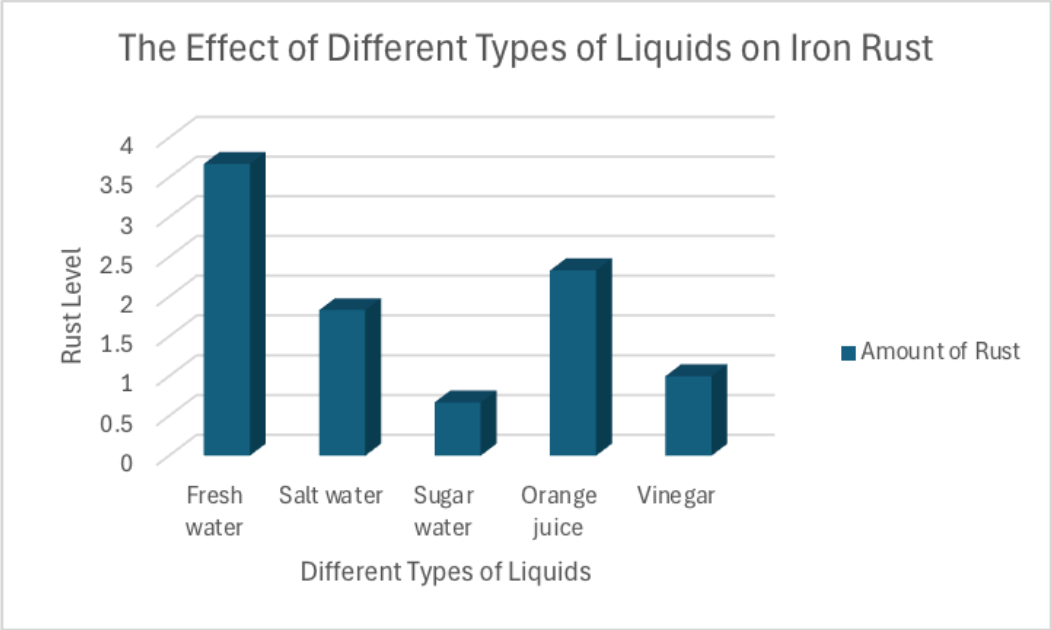
Data/Observations

The Effect of Different liquids on the Rust of Iron Pyrite Cubes

	Cup 1	Cup 2	Cup 3	Mean
Fresh water	4	2	5	3.67
Salt water	2	1	2.5	1.83
Sugar water	0	0	2	0.67
Orange juice	3	3	1	2.33
Vinegar	0	2	1	1

Scale:
0-no color change
1-minimal amount of color change
2-some color change
3-moderate color change
4-substantial color change
5-greatest change on color

Graph


The Effect of Different Types of Liquids on Iron Rust
Rust Level
4
3.5
3
2.5
2
1.5
1
0.5
0
Fresh water
Salt water
Sugar water
Orange juice
Vinegar
Different Types of Liquids
Amount of Rust

Conclusion

The hypothesis that if iron pyrite cubes are soaked in salt water they will rust faster than other liquids is rejected. The data showed that the iron pyrite cubes were most rusted in freshwater, with a mean rust level of 3.67,not salt water, with a mean rust level of 1.83. The freshwater has the highest average amount of rust out of all five types of liquids, means of all the liquids: freshwater 3.67, orange juice 2.33, salt water 1.83, vinegar 1, sugar water 0.67. The small amount of change on the iron pyrite cubes in this experiment may be due to the slow rate of reaction. This experiment may be retested by using pure iron cubes or increasing the testing time.

Error Analysis

In the experiment, the main material is iron, but it is hard to find pure iron material, so this experiment is using iron pyrite cubes. A systematic error occurred because iron pyrite has a very big chemical difference with pure iron. One of the reactions between pyrite, oxygen, and water is ferric oxide, which will appear as yellow and orange solid. The amount of yellow and orange solids parts depend on the acidity, the less acidity the more chemical reactions on iron pyrite, the acidity from more to less: vinegar>orange juice>salt water and sugar water>freshwater. It is close enough to the results of this experiment when counting the iron elements in this material. While running the experiment, an experimenter error occurred when the glove that used for orange juice was accidentally used for freshwater cup 1 after, that could affect the results, but after reset a new cup of freshwater with iron pyrite cube in it, turns out there isn't a big difference between those two.

Works Cited

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