

# Pennies in different Acids

## Research Question

How do different acids affect the rate or corrosion?

## Data Analysis/Results



## Methodology

1. choose 6 acids to use for the experiment
2. take out 6 pennies and take a picture of them for before
3. takeout 6 beakers and fill them each to the 10 ml mark with one of the acids
4. place one penny in each of the beakers
5. wait 1 week
6. After one week come back to check on them
7. take out the pennies with the tweezers and take pictures of them
8. place the pennies back where they were and wait another week
9. After another week check once more and take pictures of it to conclude the experiment

## Interpretation/Conclusions

In my project I wanted to see how different acids affected the rate of corrosion. My hypothesis was that citric acid and acetic acid would increase corrosion more than other liquids. My results partially supported my hypothesis because citric acid didn't really do much, but acetic acid did a lot more than any of the other acids.

# Introduction

In my project I wanted to see how different acids affected the rate of corrosion. My hypothesis was that citric acid and acetic acid would increase corrosion more than other liquids. In my experiment I put 6 different pennies into 6 different acids to see what would happen after two weeks. My results partially supported my hypothesis because citric acid didn't really do much, but acetic acid did a lot more than any of the other acids. If I were to do this experiment again, I would try a lot more acids. If I was to extend it, I would definitely try these acids on other metals like nails, and quarters to see if they would have different results.

What is an acid? The dictionary defines an acid as a chemical substance that neutralizes alkalis, dissolves some metals, and turns litmus red. Many acids have different effects. For example, copper does not dissolve in many acids, but sulfuric acid dissolves copper. What would happen if you put 6 pennies in 6 different acids? For my project I did just that. I used citric acid, acetic acid, white vinegar, lemon juice, tomato juice and black coffee. All of these interact differently with pennies, some darken the pennies, some clean them, and some might form crystals on top of them.

Pennies are made of Zinc covered in copper; how do pennies interact with different liquids? Some liquids like vinegar, lemon juice, and orange juice clean pennies. Some might cause oxidation, which makes the penny black in some parts. Some might even grow crystals on it. When zinc is exposed to the acid in some acids like lemon juice and black coffee, the acid oxidizes or removes electrons from the zinc. When zinc interacts with acetic acid a soluble metal salt is formed called zinc acetate.

# Question/Problem and Predictions

Question: How do different acids affect the rate or corrosion?

Hypothesis: I predict that Citric acid and Acetic acid will increase corrosion more than the other liquids.

# Investigative Methods and Procedure

Variables:

IV: The solution the pennies are in

DV: The rate of corrosion

Materials:

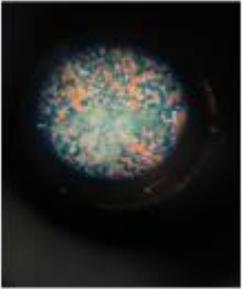
- Citric Acid
- Acetic Acid
- Vinegar White
- Lemon Juice
- Tomato Juice
- Black Coffee
- 6 Beakers
- Tweezers
- 6 pennies

Procedure:

1. choose 6 acids to use for the experiment
2. take out 6 pennies and take a picture of them for before
3. take out 6 beakers and fill them each to the 10 ml mark with one of the acids
4. place one penny in each of the beakers
5. wait 1 week
6. After one week come back to check on them
7. take out the pennies with the tweezers and take pictures of them
8. place the pennies back where they were and wait another week
9. After another week check once more and take pictures of it to conclude the experiment



# Results and Data Visualization

<p>Pennies before</p> 	<p>Pennies after being put in acids</p> 	<p>Pennies after a week of soaking in the acids</p> 	<p>Pennies after a week</p> 	<p>Pennies after 2 weeks</p> 
<p>Pennies after 2 weeks</p> 	<p>Couldn't take out the coffee Penny</p> 	<p>Couldn't take out the lemon penny either</p> 	<p>Vinegar white penny after 2 weeks</p> 	<p>Acetic Acid after 2 weeks</p> 

# Discussion and Interpretation

Checking back on my pennies after a week there wasn't many changes, some started changing color a bit but there was no major changes. I had time so I let the pennies soak for another week, coming back there was now a lot more things that changed. Some had started growing crystals on them, one even changed colors and grew crystals, probably due to a chemical reaction. One of the pennies even had oxidation happening so it turned black. One of them didn't have any big changes, it just got sticky and shiny.



Left: penny in vinegar  
Middle: penny in lemon juice  
Right: penny in coffee

# Implications and Ideas for Future Research

In my project I wanted to see how different acids affected the rate of corrosion. My hypothesis was that citric acid and acetic acid would increase corrosion more than other liquids. My results partially supported my hypothesis because citric acid didn't really do much, but acetic acid did a lot more than any of the other acids. If I were to do this experiment again, I would try a lot more acids. If I was to extend it, I would definitely try these acids on other metals like nails, and quarters to see if they would have different results.

# References

[How Acids Affect the Rate of Corrosion and Rust | Science Project \(sciencebuddies.org\)](#)