

## Green coins



English 1p and 2p coins are made from Copper. Copper is a chemical element (Cu) that can be found on the periodic table. Copper can be found in other things too, such as particular foods (nuts, shiitake mushrooms, oysters, leafy greens) and rock (copper ore). It also conducts electricity so is often found in wires, and is quite soft so can easily be bent to the right shape to make pipes to bring water through the house to your taps.

In this experiment, we are going to turn some pennies green using vinegar!

### Questions

1. What makes pennies brown/orange in colour?
2. Have you ever seen a penny that has changed colour a bit? Maybe an old coin that has gone dark brown or even green?
3. What do you think might cause a coin to change colour?
4. How would you describe the taste of vinegar? Is it sweet, salty, sharp, bitter...
5. Can you think of any other foods with a similar taste?
6. What do you think contains a lot of vinegar?

### Experiment

#### What you need:

- A tub/container (any size)
- A 1p or 2p coin
- Kitchen towel
- Vinegar

#### Method:

1. Find a tub/container.
2. Fold a piece of kitchen towel in half, and half again.
3. Place the folded kitchen towel into your tub/container and soak in vinegar.
4. Put your penny/pennies on top of the vinegar-soaked kitchen towel.
5. Leave overnight.
6. The next day, observe the results. What do you see?

## Results

Write down what happened to the coins overnight.

### Answers to questions

1. Copper – this metal has a natural orange/brown colour
2. Yes/ No (depending on whether you have or haven't!)
3. A chemical reaction – the acid in the vinegar is reacting with the metal that the coin is made of.
4. Sharp (or anything else you taste!)
5. Lemon, Lime, Orange, pineapple – all these things are acidic.
6. Acetic Acid – this is one type of acid that isn't harmful when eaten in low concentrations like that found in vinegar. Another type you can eat is called citric acid and is found in citrus fruits like lemons and limes.

### Why did your coins turn green in vinegar?

Vinegar is actually an acid. The particular type of acid in vinegar is acetic acid. That's what gives it its sharp taste that might make you scrunch your face up if it's really strong!

When we soaked the pennies in vinegar, the copper in the coin **reacted** with the acid in the vinegar. This reaction forms **copper acetate** which turns the coin **green**. You have just changed the composition of a penny and its colour at the same time! Awesome.

Copper + Acetic Acid = Copper Acetate



+



=



Sometimes pennies change colour without soaking them in vinegar. Where do these different coloured pennies come from? After all, soaking a penny in vinegar is a rather odd thing to do! This is another chemical reaction. As well as vinegar, pennies can react with oxygen in the air to form copper carbonate and copper sulfate. This is why really old pennies may discolour – they have been exposed to the air for a long time. This reaction is called oxidation and will also turn pennies green over time.

Iron does something similar but instead of green, iron oxide is red and also known as rust!

### Conclusion

Chemical reactions can cause a material to change colour.

Copper reacts with acid and oxygen to form new compounds.

**Fun Fact! This is why the statue of liberty is green. It used to be brown when it was built. But oxidation over time caused it to turn green/blue.**

