

Long Description:

Explore the surprising similarities between microchips and antacid tablets through an intriguing etching experiment. Both microchips, the heart of our digital devices, and antacid tablets, used to relieve heartburn, undergo a fascinating transformation when exposed to specific conditions. In our experiment, we will illustrate how the chemical etching process alters their surfaces. By immersing antacid tablets in a solution, you'll witness the outer layers dissolve, mirroring the etching process used in microchip production. Although they serve vastly different purposes, this experiment reveals the shared principles of etching that connect them in unexpected ways.

More About the Resource:

Chip Kids is a web series about the science behind how microchips are made and how semiconductors influence our everyday lives. Each episode features a fun, hands-on experiment that can be recreated using ordinary, safe materials. The series and the accompanying learning materials aim to inspire and motivate all students to see STEM careers as exciting opportunities they can achieve.

Lesson Plan: Etch This! Understanding Etching on Microchips

Grade Level: 6-8 Middle School

Subject: Science and Technology

Standard(s) that may apply:

- **2-PS1-3.** Make observation to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
- **MS-PS1-3.** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. **(Matter and its Interactions)**

Materials:

- Antacid Tablet
- Clear Tape
- Small Cup
- Vinegar
- Spoon
- Plate
- Timer (5 min)
- Etch This! Lab Report
- TWLH Handout

- o <https://www.youtube.com/watch?v=hgtiTXd0D6g>

Essential Question

How does the etching process play a crucial role in the manufacturing of microchips, and why is precision so important in this process?

Supporting Questions

1. What is etching?
2. What would happen if etching were not done on semiconductors?
3. How are antacid tablets similar to microchips during the etching process?

Use the following before, while, and after viewing suggestions for engaging students with this resource and activities related to this topic.

Before viewing the video

Engage students in a class discussion about the term ‘*etching*’. Ask if they have ever heard of the word ‘etching’ or the process of etching semiconductors.

Explain to students that etching is the process used in microfabrication where layers are removed from a chip. This process is performed on a semiconductor, a material that can conduct electricity. During etching, parts of the semiconductor are carefully removed to create intricate patterns necessary for a chip to work properly. These patterns form tiny circuits that allow the chip to process information and perform tasks.

[FRAME] Ask students to give one real-world example of etching on devices that they use daily.

Distribute TKWL handout to students and have them complete the “T” (What We Think We Know) and “W” (What We Want to Know) portion of the activity. Allow some students to share and discuss as a class.

Divide the students into groups to conduct the experiment.

Materials needed: Antacid Tablet (such as Tums), clear tape, small cup, vinegar, spoon, timer, plate

Instructions:

1. Firmly stick two pieces of clear tape side by side onto a tablet, leaving a gap so that a 2 mm strip of tablet is exposed (tape should cover sides and bottom as well.)
2. Observe the taped tablet; predict what material will be etched away when submerged in vinegar. Draw a side profile of what you think it will look like.
3. Place the tablet in a small cup. Pour vinegar until the tablet is submerged.
4. Set a timer for 5 minutes.
5. During the 5 minutes, students to list in their lab report their **hypothesis, and observation** and illustrate what the antacid tablet looks like.
6. Observe the gas formation during reaction.
7. After 5 minutes remove the tablet with a spoon and place on a plate.
8. Observe what got etched, look top down and from the side. Does it look as you predicted? Draw what it actually looks like.

While Viewing

Have students complete their '*Etch This!*' Lab Reports.

After Viewing the Video

Review the results of with students the results of the etching of the antacid.

Have students complete the "L" (What we learned) and "H" (How we Know") portion of the activity sheet. Then follow up with the discuss questions as a class.

Discussion Questions

1. Why is etching crucial in chip fabrication?
2. What did the tape on the antacid tablet symbolize in the experiment, and why was masking the tablet necessary?
3. Was your hypothesis correct? If so, why or why not?
4. How does the etching of microchips compare to the breakdown of synthetic materials from natural resources, and how does this impact society?
5. How does the process of etching microchips resemble to the Matter being broken down to tiny pieces and being disassembled and being made into a new object?