

# Composting Chemistry

By Regina Malczewski



## Safety Suggestions

- ✓ Safety goggles are required
- ✓ Protective clothing suggested or old clothing for working in a garden
- ✓ Gloves should be worn when working in the compost pile
- ✓ Do not eat or drink any of the materials used in this activity
- ✓ Thoroughly wash hands after this activity

Note: Follow Millie's Safety Tips found in this issue of *Celebrating Chemistry*.

## Introduction

You may have heard people talking about composting and wondered what all the fuss was about ... or maybe you already have your own backyard compost bin! Composting is a way of using natural chemistry to decompose food and yard materials. This process breaks down the material into smaller “building blocks” that can be used to make new plants and animals. This process is how nature recycles!

Unfortunately, many man-made materials, like plastics, cannot be broken down in this way. Chemists are working on new kinds of plastics and materials that are more friendly to the environment, including compostable and biodegradable plastics. For a plastic to be called compostable, it has to break down in 90 days or less. Some of these new materials can actually break down in your backyard compost pile, just like fruits and vegetables!

This experiment tests different kinds of containers to see how composting works. It takes a couple months, so you must be patient as nature takes its course!

## Materials

- Compost pile (you can work with an adult to start one from yard and plant waste)
- Pitchfork or shovel
- Food containers or take-out boxes to test
- A permanent marker
- Optional materials and supplies:
  - a kitchen scale that can measure weights as small as one gram
  - camera or phone for taking photos

Note: Be sure that at least one take-out container is compostable. Brands include HeloGreen, Repurpose, and Eco-Products.

## Procedure

### Start a compost pile

You will need a compost pile. It does not need to be big, or well-established, but you do need to have some degraded material to do the test. If you are starting one, begin at least 1 month ahead of trying this activity — even longer if possible!

Gather some yard or vegetable/plant waste in a designated spot and layer it with a generous amount of garden dirt (which contains worms and bacteria), and coffee grounds if you have them. Meat and fats can be composted, but don't put them in your backyard compost pile, because they could attract pests! Water your compost pile weekly, until it is established. Each month, use a pitchfork or shovel to mix the compost pile.

## Test the samples

1. Choose your containers and label them with a permanent marker. Take photos if you like, and weigh them if you have a scale. How stiff or flexible are the materials? How strong or slimy? Record your findings.
2. Hypothesize (predict) the order in which your samples will decompose.
3. Bury your samples in the compost pile, and remember where you put them!
4. Leave the samples buried for at least 2 weeks. Do not mix or disturb them during that time. You may add more waste and grounds on top.
5. After two weeks, carefully dig up your samples. Remove any dirt or worms so that you can see more of the sample.
6. Rinse with water and allow the samples to air-dry, especially before weighing them.
7. Make observations and take some photos if you want. Record your results and observations. Do you notice any signs of decomposition?
8. Rebury the current samples if you wish. Dig up your containers every few weeks and examine them. Notice when or if the containers fall apart or if you can't find them. Some containers may remain unchanged. Make observations and take photos as you go.

## Observations

How long do different materials take to change (if they do at all)? How did the “earth-friendly” plastics compare to the regular plastics? Which do you think is better for the environment?

## How does it work? / Where's the chemistry?

Living things in the soil — mainly bacteria, fungi, and worms — break down complex materials like plants into simpler substances. These substances are made from elements like phosphorus, potassium, and nitrogen, so that plants can use them to grow and thrive. Composting is how nature recycles. By decaying and breaking down dead plants and animals, nature uses their “building blocks” to help new living things grow.

This is why many chemists are thinking up new ways to make food containers. Some are experimenting with new polymers made from plant and other materials. These can help make the containers stronger, more microwaveable, or oil-resistant. and broken down by soil worms, fungi, and bacteria ... so they will take up less space in the landfill!

Some of the containers in our experiment are examples of these new materials. They break down in the environment and add nutrients to the compost. Later, you can add the compost to turn regular dirt into the kind that plants grow best in. Now you can use what you have learned to make great soil for your home or community garden. Happy composting!

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