

# DIAPER GEL TESTING

## 💡 BIG IDEA

Play the role of a chemist working for a diaper company. Your task is to compare different diaper designs and use your findings to determine which is most effective.

## READY...

Gather materials:

- 2 bowls
- cup
- disposable diapers (2 different kinds)
- notepaper
- pencil
- plastic spoon
- scissors
- 2 sealable plastic bags
- water

## SET...

Fill the cup with water.

## GO!

1. Label each diaper "1" or "2," and then do the same for the sealable bags and bowls.
2. Observe the design of each diaper. What material(s) is it made of? What shape is it? How heavy is it relative to the other diaper? Does it have any scent or pattern? Record your observations on your notepaper.
3. Cut open the diapers along the seam and scoop out the tiny crystals (called sodium polyacrylate) into the corresponding bowls. As you do this, use the spoon to measure the quantity of sodium polyacrylate that each diaper contains and record this information on your notepaper.
4. Scoop 1 spoonful of crystals from each bowl and add it to the corresponding sealable bag. Since some diapers contain more crystals than others, this lets us see how much water each diaper can absorb for every spoonful of crystals.
5. Carry out these steps for each bag of crystals:
  - a. Using your spoon, slowly add water into each bag—until the sodium polyacrylate no longer absorbs it.
  - b. Record the amount of spoonfuls of water added on your notepaper.



*Cutting open a diaper*



*Extracting polymer crystals*

[continued from front]

6. Consider the advantages and disadvantages of each diaper design:

- Which design seems most comfortable?
- Which design absorbs the most water per spoonful of sodium polyacrylate? (Some diapers may absorb better than others because manufacturers use a mixture of several polymers, not just sodium polyacrylate.)
- Which design absorbs the most water in total (found by multiplying the volume of sodium polyacrylate by the absorption per teaspoon)?

*Chemical safety and disposal: Sodium polyacrylate is nontoxic, though it can irritate the eyes. It should not be disposed of down the drain! Instead, place the gel and any unused crystals in the garbage.*

## WHY IS THIS SCIENCE?

The white crystals in diapers are made of a polymer called sodium polyacrylate, which is hydrophilic, meaning “water-loving.” Polymers are groups of chemicals made of long chains of molecules. When sodium polyacrylate meets water, it bonds with the water molecules and holds onto them tightly—so the water can no longer act like a liquid.

This is very different from how a towel works, since in that case water molecules just hide in small crevices. When you squeeze a towel, the water is forced back out, but no amount of squeezing will make the sodium polyacrylate let go of its water molecules!

Such a polymer, which can absorb lots of water, has many uses. For example, sodium polyacrylate is often used in agriculture as an additive to potting soil. The polymer soaks up large quantities of water when there is plenty of rain, then releases it when the soil is in danger of drying out. Paints containing sodium polyacrylate are sometimes used to coat moisture-sensitive equipment. That way, if there is a lot of humidity in the air, the polymer absorbs water droplets before they can damage the equipment.

## WITH THANKS AND FOR MORE INFORMATION, VISIT:

This activity has been adapted from “Exploring a Hydrogel,” *Celebrating Chemistry*, American Chemical Society (<https://communities.acs.org/docs/DOC-56395>) and “Diaper Dissection,” *Experiencing Chemistry*, OMSI ([https://omsi.edu/sites/all/FTP/files/chemistry/Side\\_Displays/U5DiaperDissection\\_OpGuide.pdf](https://omsi.edu/sites/all/FTP/files/chemistry/Side_Displays/U5DiaperDissection_OpGuide.pdf)).