

Western Engineering Outreach

Homemade Geodes Grade K-2

Meet Today's ENG HERO!



Amin Rizkalla - Professor with Western Engineering

Amin Rizkalla is a professor with the Chemical and Biomedical Engineering Department at Western University. He has a Master's in Metallurgical Engineering and a PhD in Biomaterials Engineering. Before starting his academic career, he rose ranks to a become a Supervisor of Process Engineering at Combustion Engineering Superheater Ltd in New Brunswick. Now he has research interests in Hybrid Biomaterials and Bioceramics. To learn more about Dr. Ray visit:

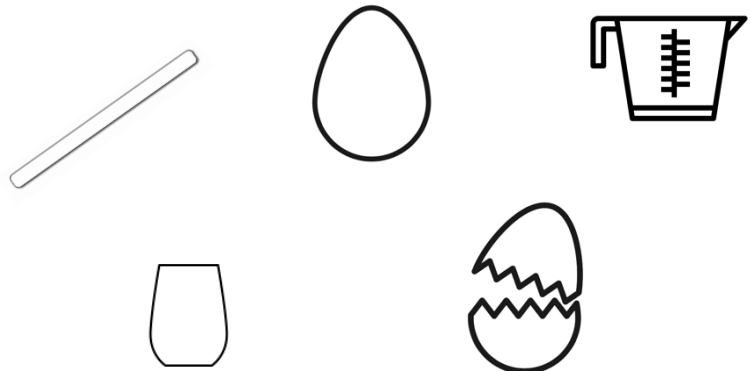
<https://www.schulich.uwo.ca/rizkallalab/>

Learning Goal:

- Students will discuss crystallization
- Students will discuss the creation of geodes
- Curriculum Connections: Grade 1 - Materials, Objects, and Everyday Structures; Grade 2 - Properties of Liquids and Solids

Materials Needed:

- Egg
- Kettle
- 1.5 cups of Epsom salt
- ¼ measuring cups
- ½ cup of water
- 4 cups
- 4 popsicle sticks
- 1-4 Food colouring colours



Engineering and Science Connections:

Today, we will learn about geodes, saturation and how this relates to crystallization.

Geodes

Geodes are rocks that are plain on the outside but can have beautiful crystals on the inside. In the Greek language, geode means "Earth-like" or "of the Earth", and geodes are round like the Earth or oblong like an egg. They can be a couple inches or several feet in size.

Geodes are created in the hollow areas of soil such as animal burrows or tree roots. They are also formed in the bubbles in volcanic rock. Over time, dissolved minerals seep into a hollow area and harden into an outer shell creating the geode. The minerals continue to form on the inside walls of the shell, growing towards the center. The most common dissolved mineral is quartz, but amethyst and other minerals are also found.

It can take hundreds of millions of years for the space inside a geode to be filled, and many geodes remain partly hollow. A geode which is completely filled with crystals is called a nodule. Agate-filled nodules are called thunder eggs.



Geodes can have many colors depending upon the type of crystal. Purple is a typical color for amethyst. Because crystals have flat, clear surfaces with many facets, they reflect light and have a beautiful sparkle.

Geodes are found throughout the world, and many are concentrated in deserts. Volcanic areas are a common place to find geodes. In the United States they can be found in California, Arizona, Utah, Nevada, Illinois, Missouri, Kentucky, and Iowa. In fact, the geode is Iowa's state rock.

Saturation

In Chemistry, saturation refers to when a solute (the thing being dissolved) is being dissolved in a solvent (the thing which does the dissolving), and no more of your given solute can be absorbed into the solution. When you have an unsaturated solution, you can continue adding solute and having it dissolve. There is one final term used to describe the level of saturation a solution has, and that is supersaturated. Supersaturated solutions are past the point of saturation, and when more of a solute is added it is considered unstable and crystals will form. We will see this today with our solute being the Epsom salt, and our solvent being water.

Crystallization

Crystallization is the process where a solid forms, and the atoms become highly organized into a crystalline structure. Geode crystals can take hundreds of thousands of years to form. Luckily, in today's experiment it should only take 24 hours for your crystals to form!

Video Recommendation: What are GEODES?

<https://www.youtube.com/watch?v=msBBEuyllOQ>

Activity:

Before beginning, think about the following questions:

- What is going to happen with the salt?
- How much salt will I need to add?
- Are there ways to make different shapes of crystals?
- What if I add more salt to the solution past the point of saturation?



Creating the Geodes

- Fill a kettle and warm the water until it is hot, but not yet boiling. Ask an adult for help.
- Set out four different cups for four different crystals
- Add $\frac{1}{4}$ cup of hot water to each cup
- Add a different colour of food colouring to each cup
- Add $\frac{1}{4}$ cup of Epsom salts to each cup and stir until completely dissolved. When the salts are completely dissolved, slowly add more until the solution is completely saturated (the salts won't dissolve any more)
- Break open the eggs and dispose of the internal contents and then set them in the carton
- With the eggshells resting in the carton, pour the mixture into the shells, filling the shell about halfway. Be careful to not pour the undissolved salts into the shell!
- Place in the fridge right away. As water cools and evaporates, the salts will settle, and crystals will form
- Allow shells to sit in the fridge for 24 hours. If liquid is still in the shells, it can carefully be poured out (be careful so as not to lose any of the crystals!)

What Did You Learn?

- What is a geode?
- What do the terms saturated, unsaturated and supersaturated mean?
- How do crystals form?



Future Learning

- Turn this activity into an experiment! Try different proportions of salt and water. Try and make a much bigger geode! Will this take more salt? More time? Or less? Which combination of factors work the best and why? What colours did you use? Is there anything else you can use to change the colour of your geode? Can you find geodes outside your house? Send us your creations or any real life geodes you find!



Share your creations!

We would love to see what you made. Email us at discover@uwo.ca or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!