

Everyday things under the SEM

There are many things in our kitchen that deserve a closer look. These include salt crystals, sugar, cracked pepper, the sponge used to wash dishes, and even a boiled chicken egg shell.

Salt crystals

Sea water contains common salt (image) that crystallizes out when the water evaporates. It has a chemical name, sodium chloride.

Using the SEM Simulator samples you can look at the different types of salt crystals. **Are they all the same shape?** When the sample is magnified, smaller crystals become visible. **See if these smaller crystals are still the same shape as the larger ones.** Why might this be?



Crystals are formed because the tiny atoms of the material all line up in neat rows and columns. The way the atoms of a particular kind of salt stack together forms the shape of the crystal. Unlike particles that have bumped around in the environment or pebbles worn smooth by a river, newly formed crystals have obvious edges. Seawater contains a number of different kinds of salt which can make crystals. In contrast, purified table salt is just the one kind of salt.

Sugar crystals

See if you can notice a difference between the salt crystals and the sugar crystals by using the SEM Simulator samples. **How do the shapes differ?**

Do all the different types of sugar have the same crystal shapes? **Check to see if any of them have lost their sharp edges?** Why might this have occurred?

Peppercorns

We crush some foods to get better access to the chemicals inside. Black peppercorns are cracked or crushed before sprinkling on food to bring out the pungent pepper smell and taste.

Peppercorns are seeds of a plant; a vine native to south India. The spicy heat comes from piperine, a chemical present in the seed. In its concentrated form, piperine makes rod-like yellow crystals. Using the SEM Simulator samples see what the inside of black peppercorns looks like. **Can you see any crystals?**

Chicken eggshell

Another household material that we eat also contains columns that look at first glance like crystals. This is the common chicken egg.

Most of the eggshell is made of calcium, like our bones. But in the shell the calcium is in calcium carbonate. **Can you find the long slabs with cone-like tips in the sample provided for the SEM Simulator?** Are there other layers present too? **Count how many.** What purpose might an additional layer have?

The dome-like parts that look like crystals are called mammillae and the region above is called the palisade. **Find the tiny holes in this region.** The fibrous layer is an inner shell membrane.

Kitchen sponge

A sponge used at a kitchen sink is a common object found in homes and schools. It is used to clean surfaces of spills and to wash dishes in a sink. Even when we rinse a kitchen sponge clean after use not everything washes away. You can find out what is left behind by looking at a sponge sample using the SEM Simulator.

You can use the SEM Simulator to **investigate the kitchen sponge at different magnifications**. Look at the web-like structure that makes it feel spongy when squeezed. All those holes help soak up fluids which can be squeezed out later. **Looking closer, can you see anything else?**

Bacteria are tiny organisms that grow just about everywhere. They can look like tiny rods or little ball-shapes. Sometimes bacteria are called germs, because some cause sickness and infection. But many bacteria are helpful. For example, they are used to make yogurt and keep our gut healthy.

Can you see any rod-like or ball-like shapes on the surface of the kitchen sponge? **How many different shapes are present?** From this you should be able to **work out how many different kinds of bacteria are present** on this kitchen sponge. You might like to print off a picture and colour in the different types.

Bacteria make more of themselves by splitting apart. Each side then separates and becomes a whole organism. They reproduce quickly so there are usually examples that look like mirror-images, joined at a flat region. These can appear as dumbbells, or linked sausage shapes, shorter than the single sausage shapes that are present. **Can you see any bacteria in the sample viewed under the SEM Simulator that appear to be in the process of splitting into new ones?**

Internet resources

Sea salt crystals can be seen growing at:

<https://www.youtube.com/watch?v=eITaI8jRYUc>

It is fun to grow your own crystals. There are videos that show how to do this:

<https://www.youtube.com/watch?v=9zoh-COQAQM>

Basic crystallography:

<http://easyscienceforkids.com/all-about-crystals/>

Pepper and extracting piperine (high school chemistry level):

<https://www.youtube.com/watch?v=FdFEEwon6nl>

Chicken egg structure:

https://www.researchgate.net/publication/51895246_The_eggshell_structure_composition_and_mineralization

Carbonate acid test:

It is easy to tell if something contains carbonate, like calcium carbonate. Just drop some acid onto the surface. Vinegar is a weak acid but when dropped onto egg shell it will cause the shell to produce bubbles of gas, dissolving the calcium carbonate. The acid breaks the chemical apart and the gas that bubbles off is carbon dioxide – the chemical we breathe out of our lungs. Such a test is used in the study of rocks too:

<http://geology.com/minerals/acid-test.shtml>

Bacteria:

<https://www.youtube.com/watch?v=ICWLF9lccNk>

<http://www.ducksters.com/science/bacteria.php>

http://www.biology4kids.com/files/micro_bacteria.html