

Crystal Size and Cooling Rate – Teacher Notes

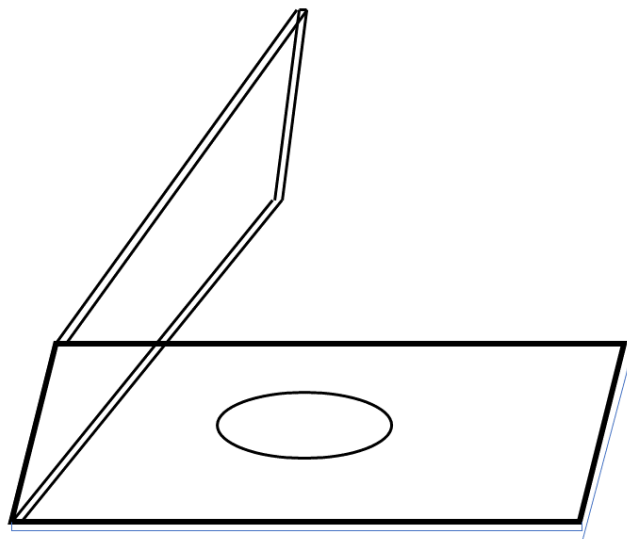
Igneous rocks can either be intrusive (formed by magma cooling inside the Earth) or extrusive (formed by lava cooling at or near the Earth's surface).

The **aim** of this investigation is to determine how crystal size is linked to cooling rate and relate this to intrusive and extrusive igneous rocks.

Students should find that rapid cooling leads to smaller crystals forming, whereas larger crystals grow when a solution cools slowly. This means that extrusive rocks will generally have smaller crystals than intrusive rocks as extrusive rocks cool quickly due to their exposure to air (or water).

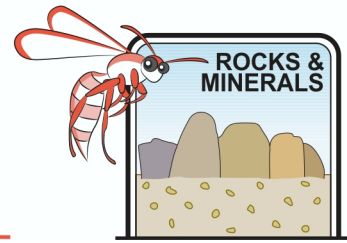
Materials per student or group

- Test tube containing warm Salol (from water bath) The water bath should be at about 45°C and each test tube should be about ¼ full. The glass rods or pipettes should be in the Salol solution so that they are at the same temperature as the Salol.
- Pipette or glass rod
- Two warm glass slides can be heated on a window sill if it is a sunny day
- Two cool glass slides (must be kept cool until ready to be used, so only collect them when you are ready to use them and work quickly) We recommend putting them in the freezer and then leaving them on ice until they are going to be used.
- A hand lens or microscope
- Piece of coloured paper



Method

1. Use the pipette or glass rod to place a drop of Salol on one of the warm slides and then quickly place the other warm slide on top. Gently press it down to force the Salol to spread.
2. Repeat the process using the cool slides.
3. Place the slides on the coloured paper and watch the crystals grow using a hand lens or microscope.



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Results and Conclusions

Did the crystals start growing on the warm slides or cold slides first? **Students should find the crystals first formed on the cold slide.**

Did the crystals grow largest on the warm slides or the cold slides. Why do you think this occurred?

The crystals on the warm slide grew larger and more slowly. In warmer temperatures, the distance between molecules is greater, which allows crystals to form larger and at a much more uniform rate than can occur at colder temperatures.

Which slides are modelling the formation of intrusive igneous rocks and which slides are modelling the formation of extrusive igneous rocks?

The warm slides represent the intrusive igneous rocks and the cold slides represent extrusive igneous rock.

What can you conclude would be the difference between crystals in an intrusive versus an extrusive igneous rock?

Crystals in an intrusive igneous rock will be larger than crystals in an extrusive igneous rock.