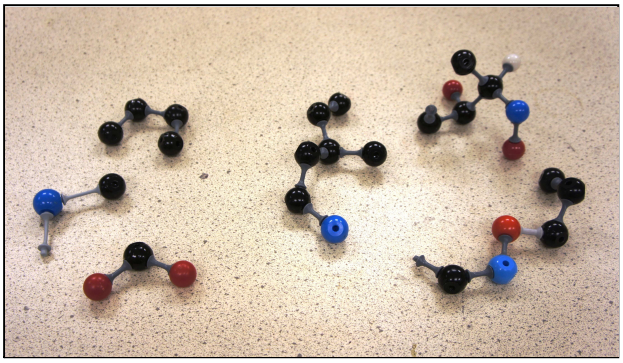
The unfair 'build your own crystal' race

A crystal-building 'race' showing the greater the time available, the larger the crystals

Divide the class into half, then divide the halves into smaller groups. Give each group the materials to build an atomic model (eg. Molymod™ balls and connectors, or building blocks of a toy like Lego™). When you say 'go' ask them to start building as big a model as they can, in the time available. Then give one half of the room only 10 seconds and the other half of the room 40 seconds to complete their models.

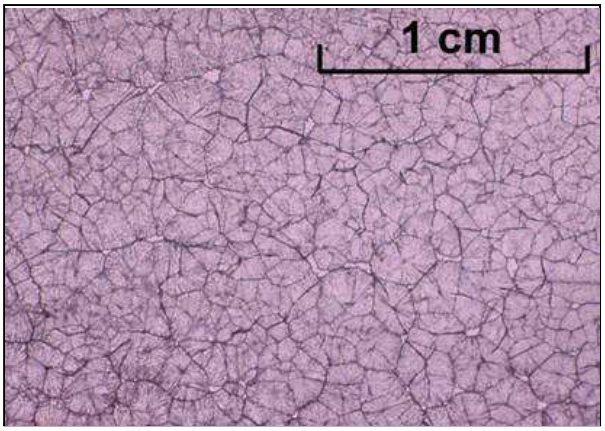
The result is very clear, but memorable – that the longer the time available, the larger the model. This simulates the growth of crystals in cooling magmas to form igneous rocks – the longer the time available, the larger the crystals. Thus fast-cooling extrusive igneous rocks like lavas are fine-grained, whilst slow-cooling intrusive igneous rocks are coarser-grained.



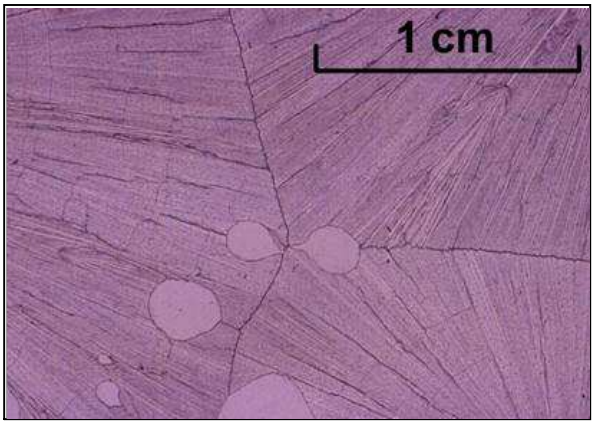
Small 'crystals' – little time; larger 'crystals' – more time.

Photo Chris King

The 'slow cooling = large crystals; fast cooling = small crystals' mantra is also shown by the results of the Salol cooling activity in the Earthlearningidea activity 'Why do igneous rocks have different crystal sizes' pictured below and opposite.



'Fine-grained' Salol – Did it crystallise quickly or slowly?

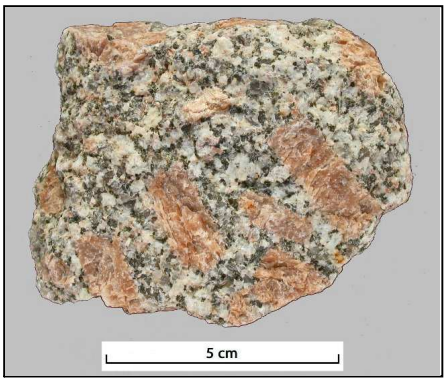


'Coarse-grained' Salol – Did it crystallise quickly or slowly?

Salol photos from the JESEI website, http://www.esta-uk.net/jesei/

Finally ask pupils to put the rocks in the pictures in order of the amount of time available for cooling and crystallisation.

Fine-grained lava



Coarse-grained igneous rock

Rock images photographed by Peter Kennett, from the Earth Science Education Unit's 'virtual rock box' at: http://www.earthscienceeducation.com/virtual_rock_kit/index.htm

Medium-grained igneous rock

The back up

Title: The unfair 'build your own crystal' race

Subtitle: A crystal-building 'race' showing the greater the time available, the larger the crystals

Topic: A quick 'game' which can be used as a lesson 'starter' to show that the more time there is available to 'build' a crystal or model, the larger it will become.

Age range of pupils: 11 – 16 years

Time needed to complete activity: 10 mins

Pupil learning outcomes: Pupils can:

- model the mantra 'slow cooling = large crystals; fast cooling = small crystals'.

Context:
The activity can be used as a 'starter' or plenary activity for a lesson on the crystallisation of igneous rocks, emphasising that the more time there is available for the magma to cool and crystallise, the larger the crystals will be. Thus in the Salol photos, the larger crystals took much longer to grow on the warm microscope slide than the smaller crystals did, on the slide from the freezer. The coarse-grained igneous rock (granite) may have taken thousands of years to cool; the medium-grained rock (microgranite) may have taken years or hundreds of years to crystallise whist the fine-grained rock (rhyolite) may have solidified in days or weeks.

Following up the activity:
Try the Earthlearningidea (ELI) Salol-cooling activity '*Why do igneous rocks have different crystal sizes'* or the forthcoming ELI *"Crystallisation' in a pudding dish'* activity.

Underlying principles:

- Crystals grow in liquids as the atoms come together to form atomic lattices.
- The longer the time available for growth, the larger the atomic lattices, and the crystals they form, become.

Thinking skill development:
Understanding the link between the classroom models and the sizes of real crystals is a bridging activity.

Resource list:

- small sets of Molymod™ molecule-building materials (of any colour) per group, or sets of a building block toy like Lego™ or Knex™

Source: The idea was first published using Lego™ bricks in the 'Perfect Ice Cream' activity within the 'Cook!' unit of the Association for Science Education's 'Wikid' series of resources. It was adapted by Linda Farr at Shavington High School, Cheshire by using Molymod™ models as the 'crystal-building materials'.