

Igneous Rocks--Common Q/A

Earth Science Essentials
by Russ Colson

OK, I get the idea that big crystals cooled slowly and small crystals cooled fast. But how can you have some crystals that cooled fast and others slow in the same rock? If the crystals are close together, don't they have to cool at the same rate?

It's not the separate crystals that cool fast or slow, but the entire rock while it is still molten. Molten rocks don't freeze all at one temperature like ice, but rather freeze over a range of temperatures, with some types of minerals crystallizing at higher temperature and then other minerals joining in at lower temperatures. When the rock is cooling slowly within the Earth's crust, the big crystals grow. These are the minerals that form first at a higher temperature. Later minerals crystallize at a time when the temperature has decreased to a value where these minerals become stable in the melt. In the case of porphyritic rocks, this temperature is reached at a time when the temperature is falling rapidly, such as due to eruption onto Earth's surface.

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