

# Extrusive Cooling Encyclopedia Article

## Extrusive Cooling

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# Extrusive Cooling

**Igneous rocks** formed at ground level are termed extrusive. A body of extruded **magma** (molten **lava**) cools more rapidly than an equal amount of magma intruded into preexisting **rock** because all extruded magma is bathed, at least on its upper surface, in a coolant (e.g., air or **water**). Gobs of lava blown high into the air by a volcanic eruption may even solidify before reaching the ground, producing the streamlined, glassy rocks termed volcanic bombs. At the opposite extreme, a lava flow many yards thick may take days or weeks to crystallize all the way through and years to cool to ambient **temperature**. Even a thick lava flow, however, cools very rapidly compared to an intrusion of comparable dimensions, which may take hundreds or thousands of years to crystallize.

Fast cooling does not permit the formation of large **crystals**, so extrusive cooling produces either very fine-grained crystalline rock or volcanic **glass**, which contains no crystals at all. Because glasses are inherently unstable and spontaneously reorganize into fine-grained crystalline rocks over millions of years, truly old (pre-Cenozoic) glasses are rare.

Another feature of extrusive cooling is that **atmospheric pressure** is much lower than the pressures under which magmas form. Magma's volatile components, that is, those substances that tend to separate out at high temperature and low pressure (especially water), are therefore quickly lost by extruded magma, and are not present during crystallization. Reduced water content in a magma permits many **minerals** to crystallize at higher temperatures, further speeding the rapid crystallization caused by fast cooling.

## See Also

Amorphous; Intrusive Cooling; Lava; Volcanic Eruptions; Volcano