

GLG 101 - CHAPTER 4 - IGNEOUS ROCKS

- **Igneous** rocks form when magma cools and solidifies.
- When magma cools and solidifies beneath the surface, **intrusive** or **plutonic** rocks are produced.
- When magma reaches the surface, it *erupts* as **lava**. Cooled and solidified lava forms **extrusive** or **volcanic** rocks.
- The solidifying of magma is called **crystallization**.
- Cooling rate controls crystal size - faster cooling yields smaller crystals; slower cooling yields larger crystals. Extremely fast cooling can produce volcanic **glass**.
- Igneous rocks are classified by their **texture** (crystal size(s) and whether or not there are trapped gas bubbles) and **mineral composition** (different mineral types produce different rock colors).
- The two-size (one smaller and one larger) texture is called **porphyritic**.
- **Bowen's reaction series** shows the order of mineral crystallization from magma for igneous rocks (in general). The **discontinuous** side shows minerals that form only over narrow ranges of temperature, with increasingly complex silicate structures as temperature decreases (from isolated tetrahedra down through chains and sheets to framework structures). The **continuous** side shows that **plagioclase feldspar** forms over a wide temperature range by substituting sodium for calcium in its structure with decreasing temperature.
- **Mafic** rocks are dark in color (black or green) and contain mostly minerals relatively poor in silica that formed near the top of Bowen's reaction series.
- **Intermediate** rocks are typically medium to light gray or black/white in color and contain mostly minerals from the middle part of Bowen's reaction series.
- **Felsic** rocks are light in color and contain mostly minerals rich in silica and formed near the bottom of Bowen's reaction series.
- During the crystallization of magma, its composition can change by **crystal settling** (of minerals denser than the liquid melt). The process of changing the composition of a magma from its original composition by any of a variety of means is known as **magmatic differentiation**.
- Other ways (besides crystal settling) by which magma composition (NOT "comparison", which is a typo in the text) can change include the incorporation of foreign material by "melting it in", termed **assimilation**, and the process of **magma mixing**.
- Magmas can be produced by raising temperature, reducing pressure and/or by introducing more water into the system. Not all of the minerals in the original rocks melt, only the lower melting point ones do, so that it is said that "**partial melting**" occurs, and the magma that is produced will be nearer the bottom of Bowen's Reaction Series in composition than was the rocks from which the magma originates.