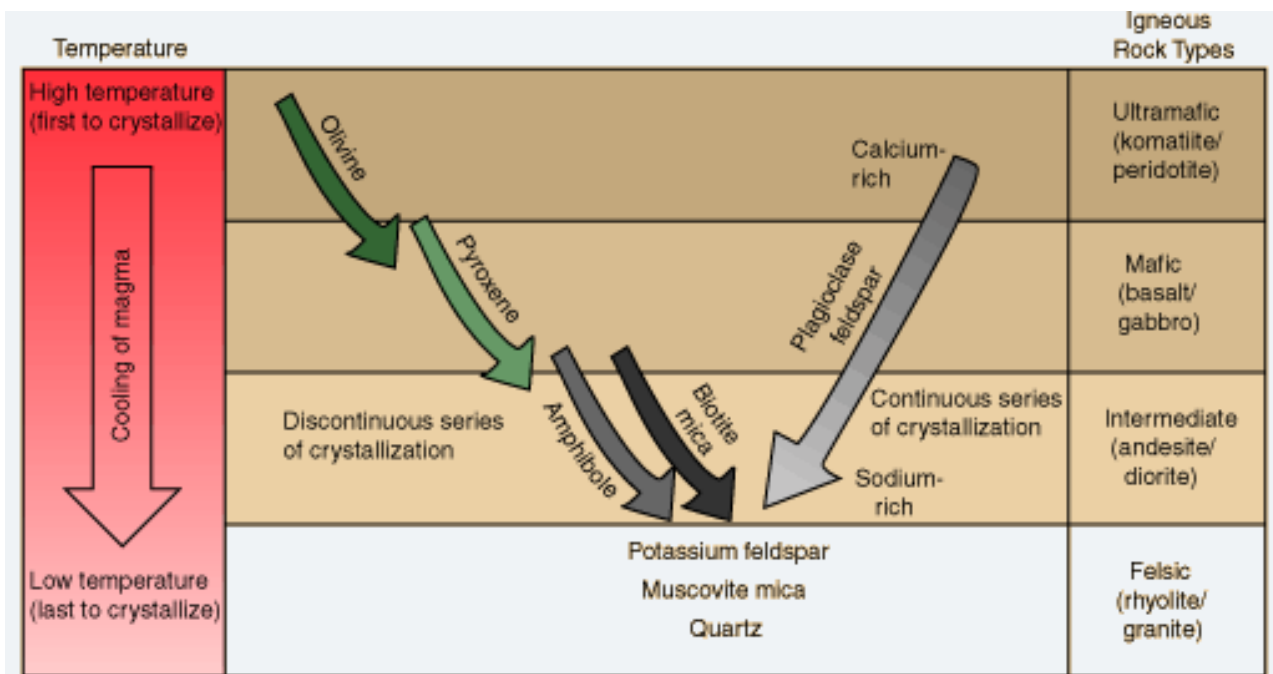


Bowen's Reaction Series



Bowen determined that specific minerals form at specific temperatures as a magma cools. At the higher temperatures associated with [mafic](#) and intermediate magmas, the general progression can be separated into two branches. The continuous branch describes the evolution of the [plagioclase feldspars](#) as they evolve from being calcium-rich to more sodium-rich. The discontinuous branch describes the formation of the mafic minerals olivine, pyroxene, amphibole, and biotite mica.

The weird thing that Bowen found concerned the discontinuous branch. At a certain temperature a magma might produce olivine, but if that same magma was allowed to cool further, the olivine would "react" with the residual magma, and change to the next mineral on the series (in this case pyroxene). Continue cooling and the pyroxene would convert to amphibole, and then to biotite. Mighty strange stuff, but if you consider that most silicate minerals are made from slightly different proportions of [the same 8 elements](#), all we're really doing here is adjusting the internal crystalline lattice to achieve stability at different temperatures.

At lower temperatures, the branches merge and we obtain the minerals common to the [felsic](#) rocks - [orthoclase feldspar](#), muscovite mica, and quartz