Inosilicates Encyclopedia Article

Inosilicates

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Inosilicates

The most abundant rock-forming **minerals** in the **crust** of the earth are the silicates. They are formed primarily of **silicon** and **oxygen**, together with various **metals**. The fundamental unit of these minerals is the silicon-oxygen tetrahedron. These tetrahedra have a pyramidal shape, with a relatively small silicon cation (Si^{+4}) in the center and four larger oxygen anions (O^{-2}) at the corners, producing a net charge of −4. **Aluminum** cations (Al^{+3}) may substitute for silicon, and various anions such as hydroxyl (OH^{-}) or fluorine (F^{-}) may substitute for oxygen. In order to form stable minerals, the charges that exist between tetrahedra must be neutralized. This can be accomplished by the sharing of oxygen atoms between tetrahedra, or by the binding together adjacent tetrahedra by various metal cations. This in turn creates characteristic silicate structures that can be used to classify silicate minerals into **cyclosilicates**, inosilicates, **nesosilicates**, **phyllosilicates**, **sorosilicates**, and **tectosilicates**.

Minerals where the silicon-oxygen tetrahedra form chains are called inosilicates. They can take the form of single chains, where tetrahedra line up single-file through the sharing of oxygen atoms, or they can form double chains where the tetrahedra of adjacent single chains also share oxygen atoms. Two important groups of insosilicates are the pyroxenes and the amphiboles. Minerals of the pyroxene group are single-chain ferromagnesian silicates; examples of pyroxene group minerals include enstatite ($MgSiO_3$) and jadeite ($NaAlSi_2O_6$). Minerals of the amphibole group are double-chain ferromagnesian silicates; examples of amphibole group minerals include grunerite ($Fe_7Si_8O_{22}(OH)_2$) and tremolite ($Ca_2Mg_5Si_8O_{22}(OH)_2$). The same cations (such as calcium and sodium) are present in both groups, but the hydroxyl anion is characteristic of amphiboles. Both pyroxenes and amphiboles are important rock-forming minerals in igneous and metamorphic rocks.

See Also

Chemical Bonds and Physical Properties