2. Mineral Groups

2.1. Non-Silicates

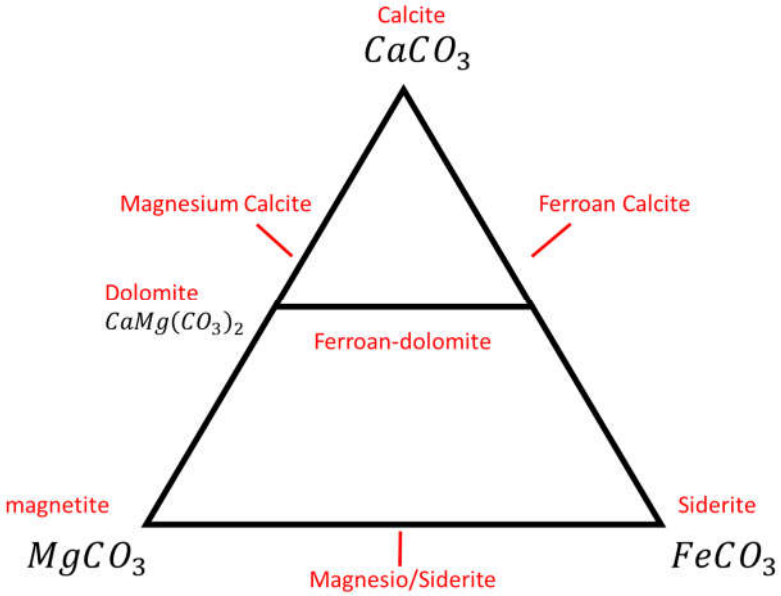
The non-silicate mineral group are ones which do not contain the $(SiO_4)^{-4}$ group. In total there are four major non-silicate groups: Carbonates, Oxides, Sulfides and Sulfates.

Non-silicates are typically accessory minerals in rocks but on some occasions are also the major component.

2.1.1. Carbonates

The carbonate complex is three oxygens around a carbon atom. In sheet form, it has regular structure and thus, good cleavage.

Typically, carbonates are found in limestone, dolomite, hydrothermal ore deposits and surficial deposits.



2.1.2. Oxide Chemistry

Oxides are minerals which contain one or more metals and oxygen, The most common that we will look at in this course are Fe-Ti-O system ones.

- Rectile TiO_2
- Hematite Fe_2O_3
- Magnetite Fe_3O_4 $Fe_2O_3 \cdot FeO$
- Ilmenite $FeTiO_2$
- Spinels XY_2O_4

Oxides occur in a variety of environments including igneous rocks, hydrothermal ore deposits and surficial deposits.

Magnetite and other spinels have two distinct structres within them. One where the cation is in four-field coordination (e.g. Fe^{+2}) and one that is six-fold coordination (e.g. Fe^{+3}).

Additionally, oxides are also the sole (or most important) source of a variety of metals such as chromium (in Chromite $FeCr_2O_4$) or Tin (SnO_2) and even Aluminium (such as bauxite).

2.1.3. Sulphide Chemistry

Sulphides occur when Sulphur bonds with metals and semi-metals. Some examples of Base Metal Sulphides include:

- Chalcopyrite $CuFeS_4$
- Chalcocite Cu_2S
- Galena PbS
- Bornite Cu_5FeS_4
- Sphalerite $(ZnFe)S$
- Molybdenite MoS_2

Sulphides occur in igneous and metamorphic bodies and hydrothermal ore bodies.

2.1.4. Sulphates and other non-silicate groups

Sulphates are similar to sulphides in composition with the exception that they require both sulphur AND oxygen. Sulphates occur in hydrothermal, alluvial and evaporative deposits. Some examples of Sulphates include:

- Gypsum $CaSO_4 \cdot 2H_2O$
- Anhydrite $CaSO_4$
- Borite $BaSO_4$