

### Oxides and Hydroxides Class

These classes consist of oxygen-bearing minerals; the oxides combine [oxygen](#) with one or more metals, while the hydroxides are characterized by hydroxyl (OH)<sup>-</sup> groups.

The oxides are further divided into two main types: simple and multiple. [Simple oxides](#) contain a single metal combined with oxygen in one of several possible metal:oxygen ratios (X:O): XO, X<sub>2</sub>O, X<sub>2</sub>O<sub>3</sub>, etc. Ice, H<sub>2</sub>O, is a simple oxide of the X<sub>2</sub>O type that incorporates hydrogen as the cation. Although SiO<sub>2</sub> (quartz and its polymorphs) is the most commonly occurring oxide, it is discussed below in the section on silicates because its structure more closely resembles that of other silicon-oxygen [compounds](#). Two nonequivalent metal sites (X and Y) characterize [multiple oxides](#), which have the form XY<sub>2</sub>O<sub>4</sub>.

Unlike the minerals of the sulfide class, which exhibit ionic, covalent, and metallic bonding, oxide minerals generally display strong ionic bonding. They are relatively hard, dense, and refractory.

Oxides and Hydroxides Class	
Name	Chemical Composition
Cuprite	Cu <sub>2</sub> O
Magnetite	Fe <sub>3</sub> O <sub>4</sub>
Chromite	(Mg, Fe) Cr <sub>2</sub> O <sub>4</sub>
Hematite	Fe <sub>2</sub> O <sub>3</sub>
Ilmenite	FeTiO <sub>3</sub>
Rutile	TiO <sub>2</sub>
Goethite	FeOOH
Bauxit	Mixture of Al-hydroxides
Limonite	Mixture of Fe-Oxide & hydroxides

### Halides Class

The halide mineral class include those minerals with a dominant halide anion ( $F^-$ ,  $Cl^-$ ,  $Br^-$  and  $I^-$ ). Complex halide minerals may also have polyatomic anions in addition to or that include halides

Halides Class	
Name	Chemical Composition
Halite	NaCl
Sylvite	KCl
Flourite	CaF <sub>2</sub>