

Minerals

Mineral Groups

2.2 What are Minerals?

5 characteristics of ALL MINERALS:

1. Naturally occurring (formed naturally)
2. Solid substance
3. Orderly crystalline structure (atoms and ions are arranged in a repeating pattern)
4. Definite chemical composition (*most* are made up of two or more elements)
5. Generally considered inorganic (non-living)



2.2 How do Minerals Form?

- Form nearly everywhere on Earth, under different conditions.
ex. deep in crust or mantle of Earth with high temps and pressure – silicates.
- There are 4 major processes through which minerals form:
 1. Crystallization from magma
 2. Precipitation
 3. Pressure and temperature
 4. Hydrothermal solutions

2.2 How do Minerals Form?

1. Crystallization from Magma

- Magma = molten rock (formed deep within Earth)
- When magma cools, elements combine and minerals form
- First minerals that crystallize and usually those that have a lot of iron, calcium and magnesium.
- Composition of magma changes as minerals form: sodium, potassium and aluminum are then most common in minerals.

Minerals Formed as a Result of Crystallization of Magma



2.2 How do Minerals Form?

2. Precipitation

- Water in lakes, rivers, ponds, oceans, as well as water underground, all contains dissolved substances.
- When water evaporates, some of these substances will react to form minerals.
- Changes in water temperature can also cause dissolved materials to precipitate.
- Limestone and calcite are examples.



2.2 How do Minerals Form?

3. Pressure and Temperature

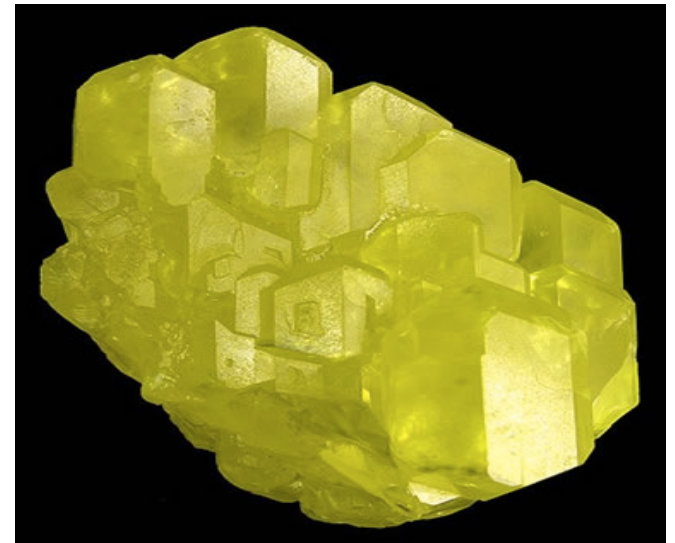
- When existing minerals undergo changes in pressure and temperature, minerals can form.
- High pressure can make a mineral recrystallize to form a more compact mineral.
- Temperature changes can make minerals unstable and new minerals will form.
- Talc and muscovite are examples.



2.2 How do Minerals Form?

4. Hydrothermal Solutions

- Hydrothermal solution: very hot mixture of water and dissolved substances.
- Temps between 100-300 degrees Celcius
- When in contact with existing minerals, these solutions go through chemical reactions to make new minerals.
- Sulfur minerals are examples.



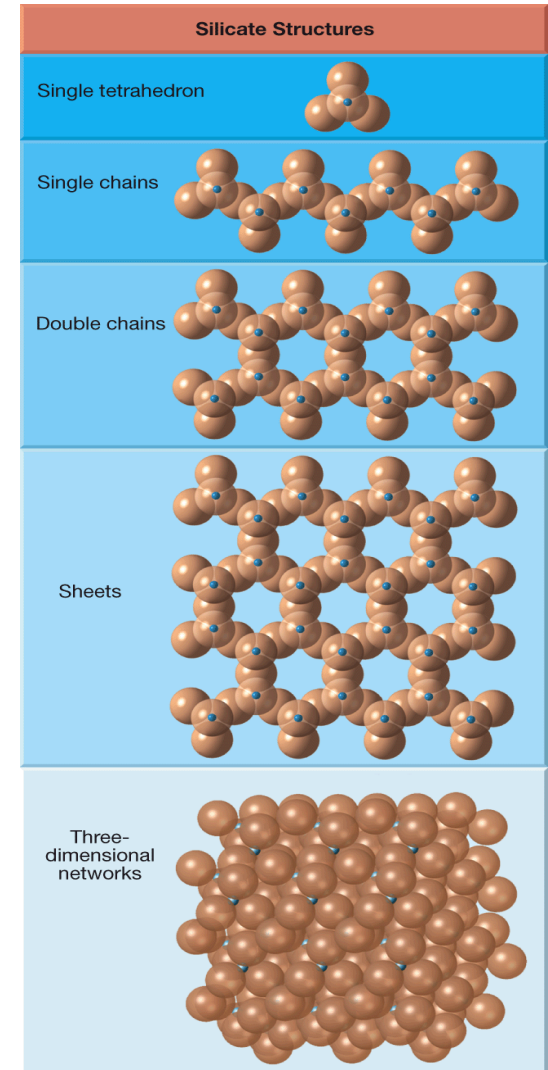
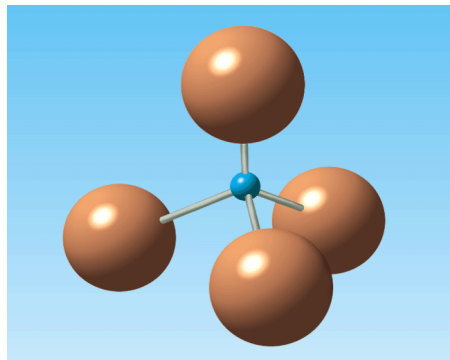
2.2 Mineral Groups

Minerals can be classified into groups based on their composition.

1. Silicates
2. Carbonates
3. Oxides
4. Sulfates & Sulfides
5. Halides
6. Native Elements

1. Silicates

- Silicon and oxygen combine to form a structure called the **silicon-oxygen tetrahedron**. This silicon-oxygen tetrahedron provides the framework of every silicate mineral.



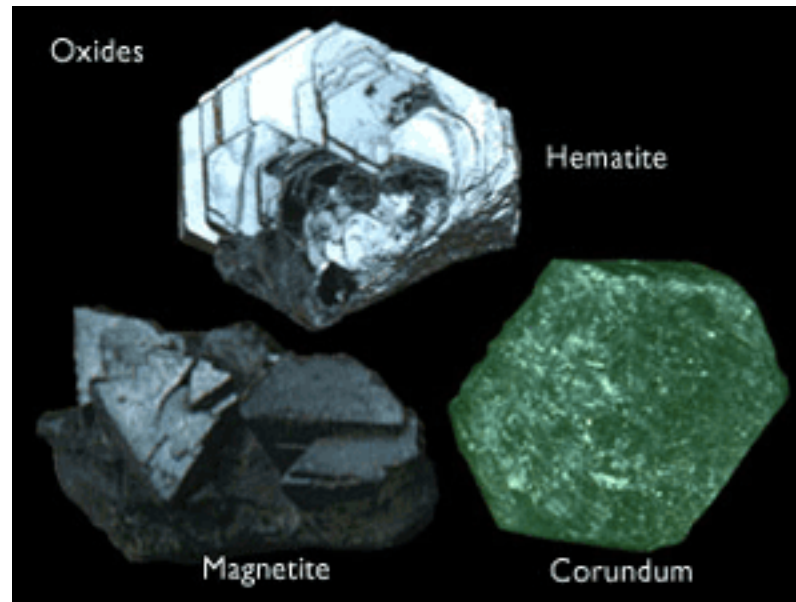
2. Carbonates

- Minerals that contain the elements carbon, oxygen, and one or more other metallic elements



3. Oxides

- Minerals that contain oxygen and one or more other elements, which are usually metals



4. Sulfates and Sulfides

- Minerals that contain the element sulfur



5. Halides

- Minerals that contain a halogen ion plus one or more other elements



6. Native Elements

- Minerals that exist in relatively pure form

