



# Mineral Characteristics

- *Naturally occurring* – formed by natural processes
- *Inorganic* – not alive; does not come from anything living
- *Solid, crystalline structure* – atoms arranged in a regular geometric pattern
- *Specific composition* – unique chemical formula (can be an element or compound)

# Examples of Minerals



Halite  
(NaCl)



Galena  
(PbS)



Pyrite  
(FeS<sub>2</sub>)

---

# How Minerals Form

- Minerals form during crystallization
  - Process by which atoms are arranged into a specific, repeating structure
- There are two ways minerals can form:
  - Crystallization of magma
  - Crystallization of materials dissolved in solution

# Crystallization of Magma

- When magma cools from a liquid state crystals form.
  - Size of the crystals depends on:
    - Rate of cooling
    - Amount of gas in the magma
    - Chemical composition of the magma



# Crystallization from Solutions

- When a solution becomes supersaturated minerals will form through precipitation.
- Minerals can also crystallize when the solution evaporates.



# Identifying Minerals

- All minerals have unique characteristics.
- You must use a combination of characteristics to correctly identify a mineral!



# Crystal Form

- Some minerals form distinct crystal shapes.



Halite always forms cubes.



Quartz forms six-sided crystals with double pointed ends.



# Luster

- The way a mineral reflects light
  - Metallic luster – shiny faces that reflect light
  - Nonmetallic luster – does not shine like a metal; can be *dull, pearly, waxy, silky, or earthy*



Metallic luster












Nonmetallic luster (earthy)

# Hardness

- Measure of how easily a mineral can be scratched
  - Friedrich Mohs developed the Mohs Scale of Hardness

# Mohs Hardness Scale



	Mineral Name	Scale Number	Common Object
	Diamond	10	
	 → Corundum	9	 Masonry Drill Bit (8.5)
	Topaz	8	
	 → Quartz	7	 Steel Nail (6.5)
	Orthoclase	6	
	Apatite	5	 Knife/Glass Plate (5.5)
	 → Fluorite	4	 Copper Penny (3.5)
	Calcite	3	
	Gypsum	2	 Fingernail (2.5)
	 → Talc	1	

# Hardness

- Mineral that can be scratched with fingernail = 2 or less
- Mineral that cannot be scratched with fingernail but cannot scratch glass = Between 2.5 – 5.5
- Mineral that can scratch glass = 5.5

# Cleavage and Fracture

- *Cleavage* – describes the way a mineral breaks along its plane of weakness
- *Fracture* – when a mineral breaks into pieces with rough or jagged edges

# Cleavage Examples



One directional cleavage



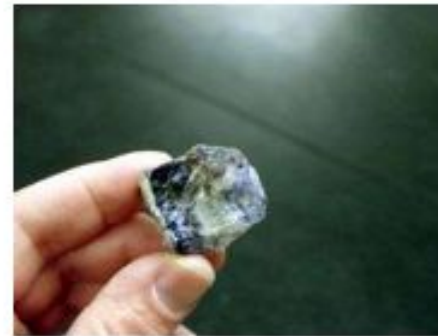
Two directional cleavage



Three directional cleavage



Cubic cleavage (halite)



Octahedral cleavage

# Fracture Examples



Conchoidal Fracture  
(arch like patterns)



Non conchoidal fracture  
(no archlike patterns)

# Color

- Most noticeable characteristic of a mineral; usually caused by presence of trace elements
- Examples: obsidian – black; sulfur - yellow





# Special Properties

- Can sometimes be used for identification
- *Double refraction* – light that travels through the mineral is split in two ways
- *Effervescence* – reacts with hydrochloric acid
- *Magnetism* – occurs between minerals that contain iron
- *Iridescence* – play of colors caused by the bending of light rays
- *Fluorescence* – glows in the dark when exposed to ultraviolet light

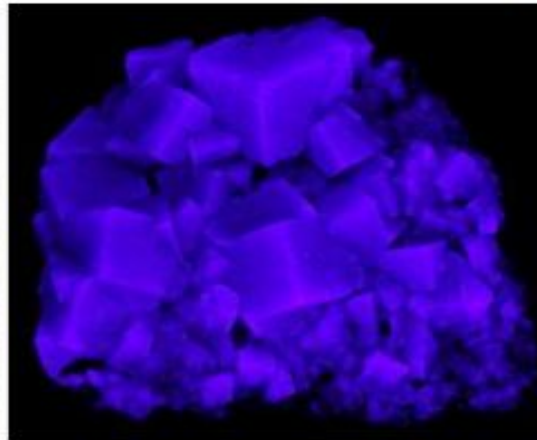
# Examples of Special Properties



Double refraction in Calcite



Iridescence in Franklinite



Fluorescence in Fluorite

# Streak

- Color of the mineral when it is broken up and powdered
- Example: Sulfur – white; hematite - red



# Texture

- How a mineral feels to the touch
- Examples: obsidian – smooth, talc - greasy



# Density and Specific Gravity

- Sometimes, two minerals of the same size have different weights (result of density)
- Density = mass/volume; reflects the atomic mass and structure of the mineral
- Specific gravity – ratio of the mass of a substance to the mass of an equal volume of water at 4 C.
  - We measure by picking up the mineral and determining how “heavy it feels” compares to how “heavy it looks.”