

Chapter 5 Outline

1. Roughly 4000 Minerals identified on earth
2. Mineralogists → People who study minerals
 - a. Began in 1828 with an optical microscope
 - b. Used Electron Microscope in 1960's
 - c. Many minerals are detrimental to the environment
3. Minerals → Naturally occurring solid, formed by Geologic processes, Crystalline structure and a definable chemical composition
 - a. Naturally Occurring: Produced in Nature, synthetic minerals are not materials in the geologic sense
 - b. Solid: State that can maintain its shape indefinitely
 - c. Geologic Process:
 - i. May form by:
 1. Freezing of molten rock
 2. Precipitation of water out of solution
 3. Chemical reactions within or on the surface of preexisting rocks
 - ii. Biogenic Minerals (byproducts of living organisms, like calcite in a clam shell) are not considered minerals
 - d. Definable Chemical Composition:
 - i. You can write a chemical formula for a mineral
 - e. Orderly arrangement of atoms:
 - i. Atoms are arranged in a fixed pattern that repeats itself over a large region relative to the size of atoms
 1. Crystalline solid → Orderly pattern
 2. Crystal lattice → Pattern itself
 - f. Inorganic, in general:
 - i. Organic minerals contain carbon hydrogen bonds
 - ii. In general because mineralogist do consider 30 organic substances to be minerals
 - g. Glass is not a crystalline substance and is not a mineral
 - i. Atoms are not arranged in an orderly fashion
4. Physical Properties → that distinguish one mineral from
 - a. Hardness and magnetization
 - i. Scratching
 - ii. Holding near magnet
 - iii. Placing acid on it
 - b. Color: way mineral acts with light
 - i. Variations in color reflect impurities
 - c. Streak: Color of powder by pulverizing a mineral
 - d. Luster: Luster refers to the way a mineral surface scatters light
 - e. Hardness: ability to resist scratching, resistance of bond to be broken
 - i. Mohs hardness scale
 - f. Specific Gravity:

- i. Pyroxenes, elongate crystals with cleavage at 90 degrees to one another
- c. Double Chain: Tetrahedra link to form a double chain by sharing 2 or 3 oxygen atoms
 - i. Black or dark brown elongate crystals, 2 cleavage directions @ 60 degrees from one another
- d. Sheet Silicates: Tetrahedra in this group all share 3 oxygen atoms and therefore link to form 2 dimensional sheets
 - i. Extremely thin flaky sheets, micas
 - ii. Clay minerals
- e. Framework silicates: Each tetrahedron shares all 4 oxygen atoms with its neighbors, forming a 3d structure
 - i. Feldspar and quartz
 - ii. Ratio 1:2

Chapter 6 Outline

1. Lava up from Volcanos
 - a. 60km/hr
 - b. New Igneous Rock made by freezing of a melt
 - c. Igeous, from Ignis, Latin
 - d. Temperature drops below 0 degrees centigrade
2. Magma, melt under surface of crust
3. Intrusive Igneous Rock, rock made by freeing of magma underground
4. Extrusive igneous rock, after it spills out (extrudes) onto the surface of the earth and comes into contact with the atmosphere or ocean
 - a. Pyroclastic debris (pyro, fire) → Debris forms when clots of lava fly into the air in lava fountains, then freeze into solid chunks b4 hitting the ground.
 - i. Fine spray of lava → Ash
 - b. Magma, only in special places
 - i. Melting as a result of a decrease in pressure (Decompression)
 1. Variation of temperature with depth, can be expressed on a graph by a curving line **geotherm**
 - ii. Pressure prevents melting a decrease in pressure permits melting, decompression melting
 - c. Melting as a result of the addition of volatiles, Flux Melting
 - i. Volatiles: H₂O, CO₂, evap. Easily and can exist in gaseous forms at the earths surface
 1. Helps break chemical bonds
 - ii. Melting curve, solidus, line defining the range of temp. and pressures that rock melts at.
 1. Wet/dry basalt
 - a. Wet-Contains Volatiles
 - i. Water, co₂ nitrogen, hydrogen, sulfer dioxide