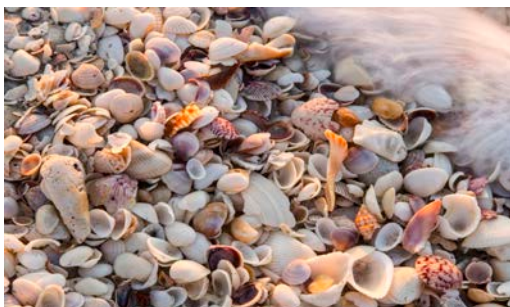


invertebrates are formed of the mineral calcite or aragonite (CaCO_3), or the mineral apatite $\text{Ca}_5(\text{PO}_4)_3$ which makes the teeth, bones of the vertebrates. Bacteria may involve in many geologic and geochemical processes which produce coal beds, oil...etc.



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Mineralogy: is the science of study of minerals from the following points:

1. Description
2. Chemical composition.
3. Classification and genesis.

Physical properties of minerals

1. Density

Density of a substance is defined as mass per unit volume. The units generally are gm/cm^3 or pound/ft^3 .

Specific gravity is defined as volume of a substance/ equal volume of water or in other words it is the ratio of the density of a substance to the density of water, therefore it has no units.

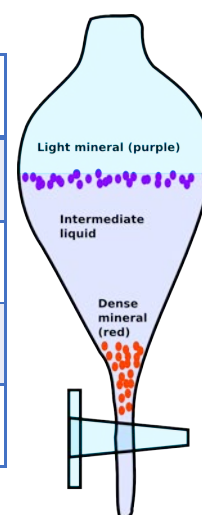
The density of a mineral is determined by its crystal structure and its chemical

composition and varies somewhat with the change in temperature and pressure.

Different methods are used to determine the density of the minerals. One of these methods is by using heavy liquids. The mineral grains are immersed in a suitable heavy liquid and we notice whether these grains sink or float. If the grains sink, that means the density of this mineral is higher than the density of this liquid and if they float, that means their density is lower than that liquid.

Heavy liquids are liquids which have high-density and specific gravity and are used to determine the densities of mineral relatively and also used in separation of mineral grains within any rock. There are different kinds of heavy liquids among them:

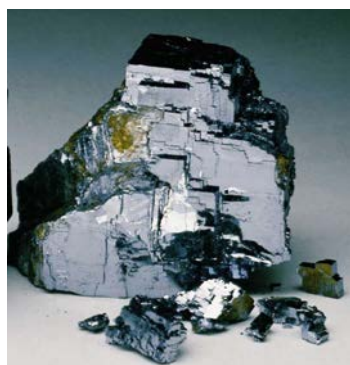
Heavy liquid	Chemical formula	Specific gravity
Bromoform	CHBr ₃	2.9
Acetylene tetrabromide	C ₂ H ₂ Br ₄	2.96
Methylene iodide	CH ₂ I ₂	3.3
Clerici solution	TIHCO ₂	4.2



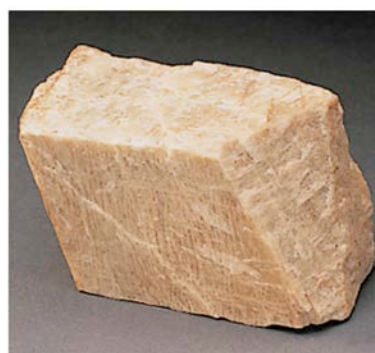
2. Luster

It is defined as the light reflection from the surface of minerals.

Two main classes of luster are recognized in minerals (a) metallic and (b) sub-metallic and (c) non-metallic.



Metallic
Galena



Non-metallic
Orthoclase

1. *Vitreous*: it is the luster of the glass. About 70% of minerals have this type of luster (generally all silicates, carbonates, phosphates...etc.).



Quartz



Calcite



Apatite

2. *Adamantine*: brilliant luster typical of diamond. Examples: zircon, cassiterite, sulfur, sphalerite, diamond, and rutile.



Diamond



Sulfur



Sphalarite

3. *Greasy, waxy, silky and pearly lusters*: examples: halite, opal... etc.



Halite



Opal