

- Amongst the common rock forming minerals *Felspathoid* minerals containing less % of silica are also present which are usually allied with Feldspars

### **Nepheline**

(Silicate of sodium  
and aluminium=>Albite

### **Leucite**

(Silicate of potassium  
and aluminium=>Orthoclase

**James Hutton** (1727–1797), the eminent 18th century gentleman farmer and founder of modern geosciences, authored the concept of the rock cycle, which depicts the inter-relationships between igneous, sedimentary, and metamorphic rocks.

# PETROLOGY

*•Is a branch of geology, which deals with study of rocks (Petro=rock, Logos=study)*

## ROCKS

### IGNEOUS

- most abundant
- primary rocks
- source is magma or lava

### SEDIMENTARY

- thin veneer above the Sial and Sima in Oceanic and Continental Crusts
- secondary rocks

### METAMORPHIC

- proportion is similar to that of Igneous rocks
- change of forms of Ig. And Sed. Due to Temperature, Pressure and Chemical Fluids

# Importance of petrology in civil Engg.

- It provides an opportunity to interpret the physical properties of individual rocks, likewise: texture, structure, mineral composition, chemical composition etc.



- This helps in knowing the *strength, durability, colour, appearance, workability* etc.



- These properties are very important for CE to know because different rocks are suitable for different purposes and no rock is ideal or best suited for all purpose.

**Granite: hard, competent, durable => suitable for foundation**

**Limestone: comparatively soft=> best for flooring**

**Marble: soft and attractive=> flooring/sculpturing etc.**

**Sandstone: sculpturing, wall etc.**

***VOLCANO:*** A gap in the Earth's Crust where molten rocks and other material escape onto the Earth's surface

***IGNEOUS ROCKS:*** The rocks formed through volcanic action OR The rocks which are derived from a molten mass “magma or lava”

## **SOURCE OF IGNEOUS ROCKS:**

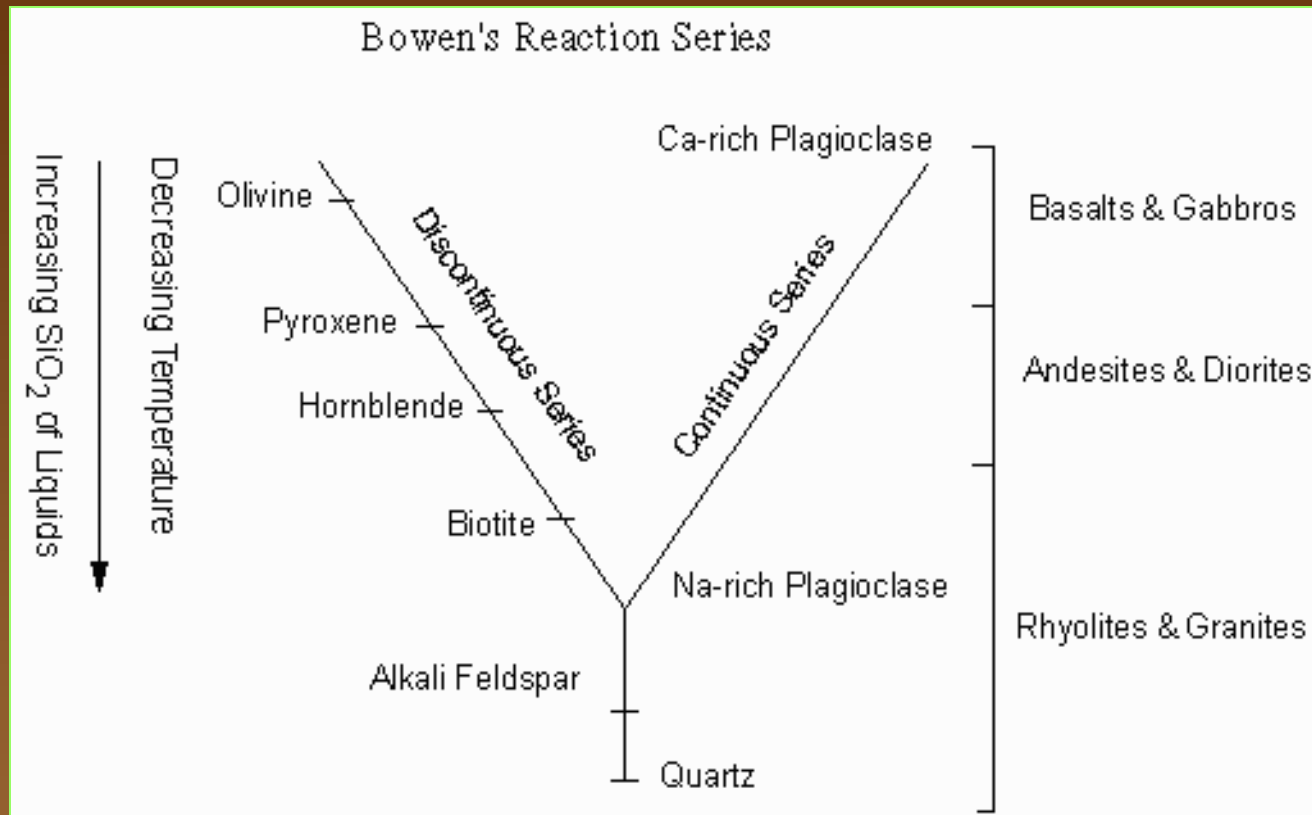
**Magma:** Molten mass comprising most abundant elements in earth – Si, Al, Fe, Ca, Mg, K, H & O. Where the  $\text{SiO}_2$  is most abundant amongst all.

Temperature of Magma- **1040<sup>0</sup> to 1200<sup>0</sup> C**

# Influencing Factors for Magma Flow and Formation of Igneous Rocks

- **Overlying sedimentary rocks as overburden plays important role in formation of igneous bodies eg: dykes, sills, laccoliths, butte, phacoliths, lopolith, volcanic necks, batholiths and chonoliths.**
- **The beddings in the sedimentary rocks facilitates the magma to move through or intrude/inject through the weak planes**

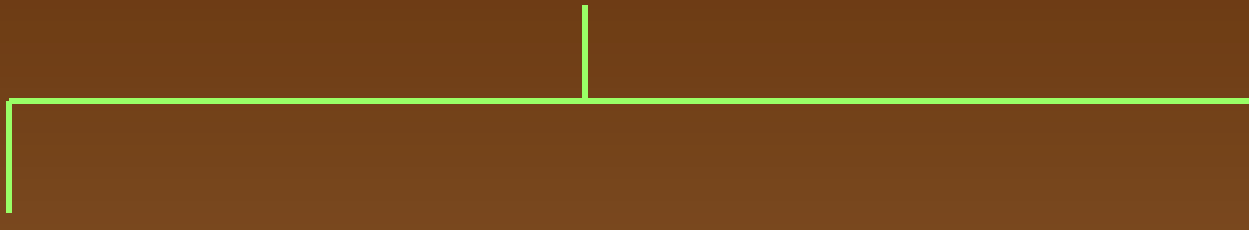
# KINDS OF IGNEOUS ROCK





## FLUIDITY OF MAGMA

Fluidity or Viscosity of magma depends on content (%) of Silica



### *Silica Rich*

- known as **Acidic magma**
- More viscous, so do not spread and pile up at one place

### *Silica poor*

- Known as **Basic magma**
- Less viscous, moves faster and occupies larger area

*However, the viscosity of magma is considerably influenced by temperature too. When temperature is less-more viscous and when High temperature- less viscous.*

# BROAD CLASSIFICATION OF IGNEOUS ROCKS

```
graph TD; A[BROAD CLASSIFICATION OF IGNEOUS ROCKS] --- B[Volcanic rocks  
(Extrusive rocks)  
-Lava or Magma flows  
-Pyroclastic flows]; A --- C[Intermediate rocks  
(Hypabyssal rocks)]; A --- D[Plutonic rocks  
(Intrusive rocks)  
-dykes, sills, batholiths, laccoliths etc.  
  
Name comes from Greek god of the underworld - Pluto];
```

## **Volcanic rocks** (Extrusive rocks)

- Lava or Magma flows
- Pyroclastic flows

## **Intermediate rocks** (Hypabyssal rocks)

## **Plutonic rocks** (Intrusive rocks)

- dykes, sills, batholiths, laccoliths etc.

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# FORMS OF VOLCANIC ROCKS

↑ Extrusive (volcanic) igneous rocks form when molten rock erupts from Earth's interior through a volcano or fissure and cools rapidly at the surface in form of Lava and hence it does not have any specific shape


**Lava flows:** On eruption lava simply flows on the surface and on the basis of surface appearance, lava flows are described as blocky lava and ropy lava



**Block Lava:** is less mobile i.e. more viscous and has a Rough and irregular surface. Vesicles are few and irregular in shape

When it cools down it results in an angular, chunky texture. This causes the lava to thicken and to break apart as the flow continues to move down slope. Such a texture is referred to as *a-a*, probably because of the pain inflicted on a person trying to walk across such a flow.





Ropy Lava: is more mobile i.e. less viscous, it has a wrinkled but smooth and shiny surface on cooling.

Vesicles are more in number, small-spherical in shape.



**pahoehoe texture**

## PYROCLASTS OR PYROCLASTIC:

Extrusive igneous rock texture referred to as *pyroclastic*. This texture results from a very explosive eruption, which sends not only lava flying through the air, but also fragments of the volcano itself. All airborne volcanic fragments, referred to as *pyroclasts*

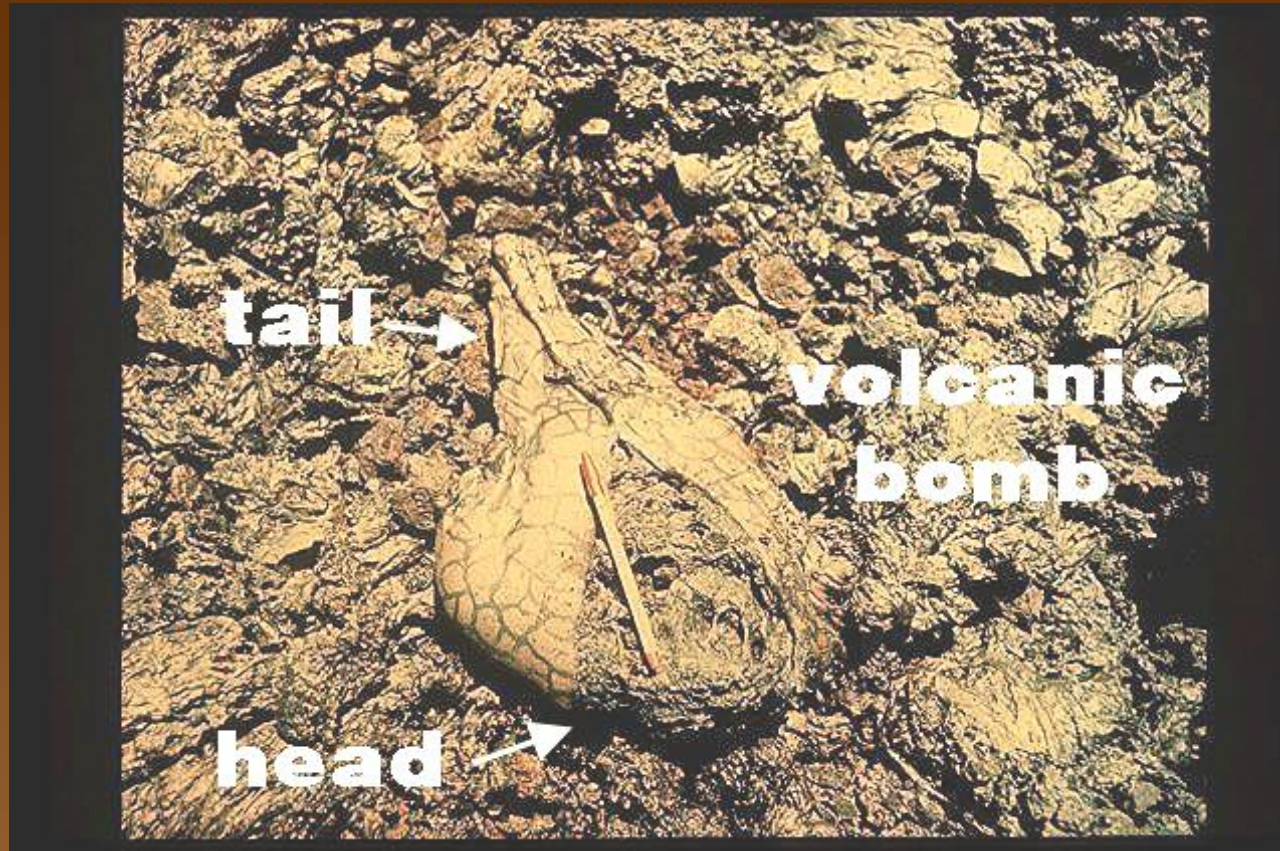


•The rock fragments thrown out during volcanic eruption are called Pyroclasts.

•Based of shape and size they are categorized

*Pyroclasts come in many sizes: the smallest are called ash, slightly larger are lapilli, and the biggest are called blocks or bombs.*





A large pyroclasts are known as volcanic bombs. Typical shape with head and a tail. Bombs can result into severe damage if they strike.