SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)
COIMBATORE-35

II YEAR / III SEMESTER

19CET201-ENGINEERING GEOLOGY

CAUSES OF VALCANO

Inside the earth's core there is a red-hot liquid rock, called magma. Volcanoes happen when magma rises to the surface of the earth, which causes bubbles of gas to appear in it.

This gas can cause pressure to build up in the mountain, and it eventually explodes. When the magma bursts out of the earth, it is called lava.

UNIT 2-MINEROLOGY

Physical properties of minerals – Quartz group, Feldspar group, Iron ore minerals – Hematite and Magnetite – Clay Minerals – Mica – muscovite and biotite, Calcite

PHYSICAL PROPERTIES OF MINERALS:

Most minerals can be characterized and classified by their unique physical properties: **hardness, luster, color, streak, specific gravity, cleavage, fracture, and tenacity**.

QUARTZ

- The most abundant mineral in Earth's crust
- Extremely resistant to weathering
- Highly resistant to physical and chemical weathering
- Used to make time pieces because it vibrates at a precise frequency

WHAT IS QUARTZ?

- Quartz is a chemical compound consisting of one part silicon and two parts oxygen.
- It is silicon dioxide (SiO_2). It is the most abundant mineral found at Earth's surface, and its unique properties make it one of the most useful natural substances

WHERE IS QUARTZ FOUND?

- Quartz is the most abundant and widely distributed mineral found at Earth's surface.
- It is present and plentiful in all parts of the world. It forms at all temperatures. It is abundant in igneous, metamorphic, and sedimentary rocks.
- It is highly resistant to both mechanical and chemical weathering.
- This durability makes it the dominant mineral of mountaintops and the primary constituent of beach, river, and desert sand.
- Quartz is ubiquitous, plentiful and durable. Minable deposits are found throughout the world

PHYSICAL PROPERTIES OF QUARTZ

Chemical Classification-Silicate

Color-Quartz occurs in virtually every color. Common colors are clear, white, gray, purple, yellow, brown, black, pink, green, red.

Streak-Colorless (harder than the streak plate)

Luster-Vitreous

Diaphaneity-Transparent to translucent

Cleavage-None - typically breaks with a conchoidal fracture

Mohs Hardness- 7

Specific Gravity-2.6 to 2.7

Diagnostic Properties-Conchoidal fracture, glassy luster, hardness

Chemical Composition-SiO_2

Crystal System-Hexagonal

Uses-Glass making, abrasive, foundry sand, hydraulic fracturing proppant, gemstones

FELDSPAR

Feldspar is the name of a large organization of rock-forming silicate minerals that make up over 50% of Earth's crust.

They are discovered in igneous, metamorphic, and sedimentary rocks in all components of the sector.

Feldspar minerals have very comparable structures, chemical compositions, and bodily properties.

Common feldspars consist of orthoclase ($KAlSi_3O_8$), albite ($NaAlSi_3O_8$), and anorthite ($CaAl_2Si_2O_8$)

COMPOSITIONS OF FELDSPAR GROUP MINERALS

This group of minerals includes tectosilicates.

Compositions of foremost elements in commonplace feldspars may be expressed in terms of 3 endmembers: potassium feldspar (K-spar) endmember KAlSi3O8, albite endmember NaAlSi3O8, anorthite endmember CaAl2Si2O8. Solid answers between K-feldspar and albite are referred to as “alkali feldspar”.

Solid solutions among albite and anorthite are called “plagioclase”,or greater nicely “plagioclase feldspar”.

Only constrained solid answer happens between K-feldspar and anorthite, and inside the two different stable answers, immiscibility occurs at temperatures commonplace in the crust of the Earth. Albite is taken into consideration both a plagioclase and alkali feldspar.

PHYSICAL PROPERTIES OF FELDSPAR MINERALS

Chemical Classification-Silicate

Color-Usually white, pink, gray or brown. Also colorless, yellow, orange, red, black, blue, green.

Streak-White

Luster-Vitreous. Pearly on some cleavage faces.

Diaphaneity-Usually translucent to opaque. Rarely transparent.

Cleavage-Perfect in two directions. Cleavage planes usually intersect at or close to a 90 degree angle.

Mohs Hardness-6 to 6.5

Specific Gravity-2.5 to 2.8

Diagnostic Properties-Perfect cleavage, with cleavage faces usually intersecting at or close to 90 degrees. Consistent hardness, specific gravity and pearly luster on cleavage faces.

PHYSICAL PROPERTIES OF FELDSPAR MINERALS

Chemical Composition-A generalized chemical composition of $X(Al,Si)_4O_8$, where X is usually potassium, sodium, or calcium, but rarely can be barium, rubidium, or strontium.

Crystal System-Triclinic, monoclinic

Uses-Crushed and powdered feldspar are important raw materials for the manufacture of plate glass, container glass, ceramic products, paints, plastics and many other products. Varieties of orthoclase, labradorite, oligoclase, microcline and other feldspar minerals have been cut and used as faceted and cabochon gems.

IRON ORE

Iron ores are rocks and minerals from which metallic iron can be economically extracted.

The ores are usually rich in iron oxides and vary in color from dark grey, bright yellow, or deep purple to rusty red.

The iron is usually found in the form of magnetite (Fe_3O_4, 72.4% Fe), hematite (Fe_2O_3, 69.9% Fe), goethite (FeO(OH), 62.9% Fe), limonite ($FeO(OH)\cdot n(H_2O)$, 55% Fe) or siderite ($FeCO_3$, 48.2% Fe).

IRON ORE

https://youtu.be/BDzbkJ-hBe4

https://youtu.be/KWa_fpaPZMo

https://youtu.be/mmkvILW2z2s

MAGNETITE

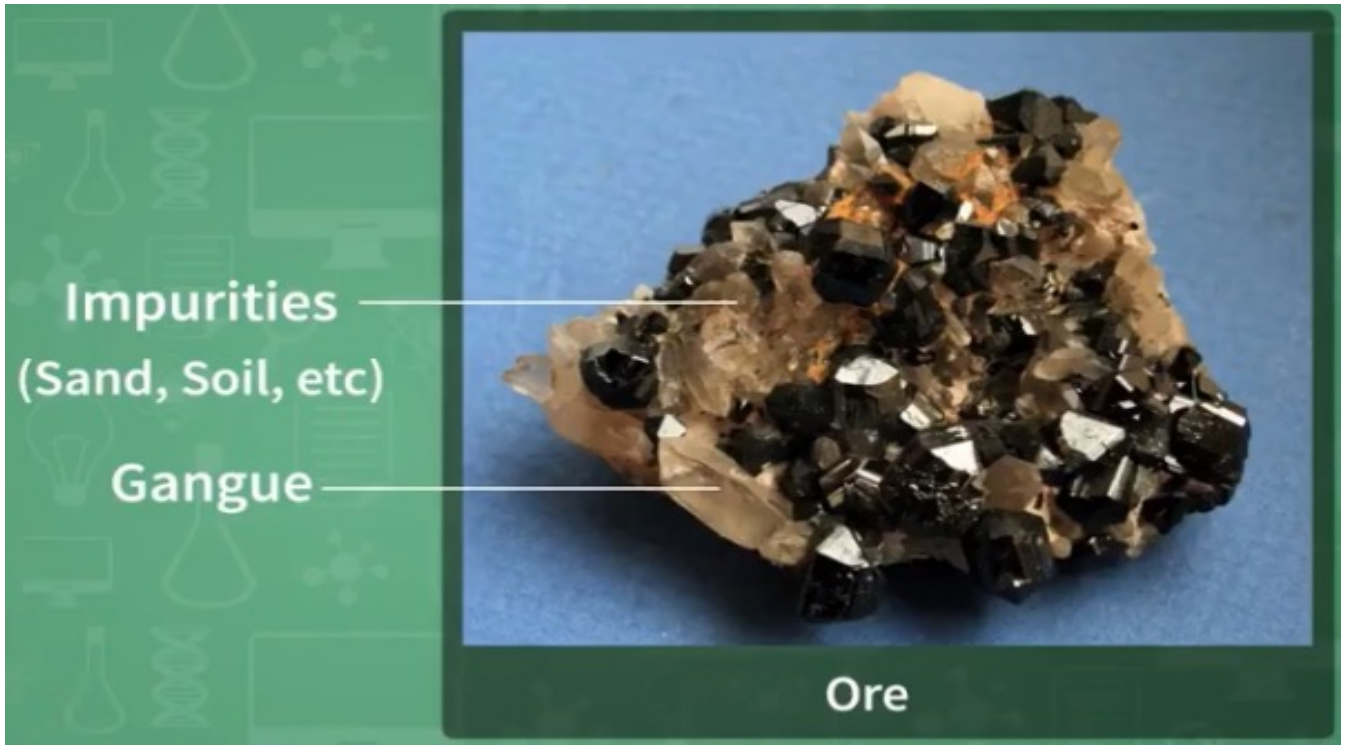
Magnetite is magnetic, and hence easily separated from the gangue minerals and capable of producing a high-grade concentrate with very low levels of impurities.

The grain size of the magnetite and its degree of commingling with the silica groundmass determine the grind size to which the rock must be comminuted to enable efficient magnetic separation to provide a high purity magnetite concentrate. This determines the energy inputs required to run a milling operation.

Mining of banded iron formations involves coarse crushing and screening, followed by rough crushing and fine grinding to comminute the ore to the point where the crystallized magnetite and quartz are fine enough that the quartz is left behind when the resultant powder is passed under a magnetic separator.

Generally most magnetite banded iron formation deposits must be ground to between 32 and 45 micrometers in order to produce a low-silica magnetite concentrate. Magnetite concentrate grades are generally in excess of 70% iron by weight and usually are low phosphorus, low aluminium, low titanium and low silica and demand a premium price.

GANGUE MINERALS



HEMATITE

Due to the high density of hematite relative to associated silicate gangue, hematite beneficiation usually involves a combination of beneficiation techniques.

One method relies on passing the finely crushed ore over a slurry containing magnetite or other agent such as ferrosilicon which increases its density. When the density of the slurry is properly calibrated, the hematite will sink and the silicate mineral fragments will float and can be removed.

USES OF HEMATITE

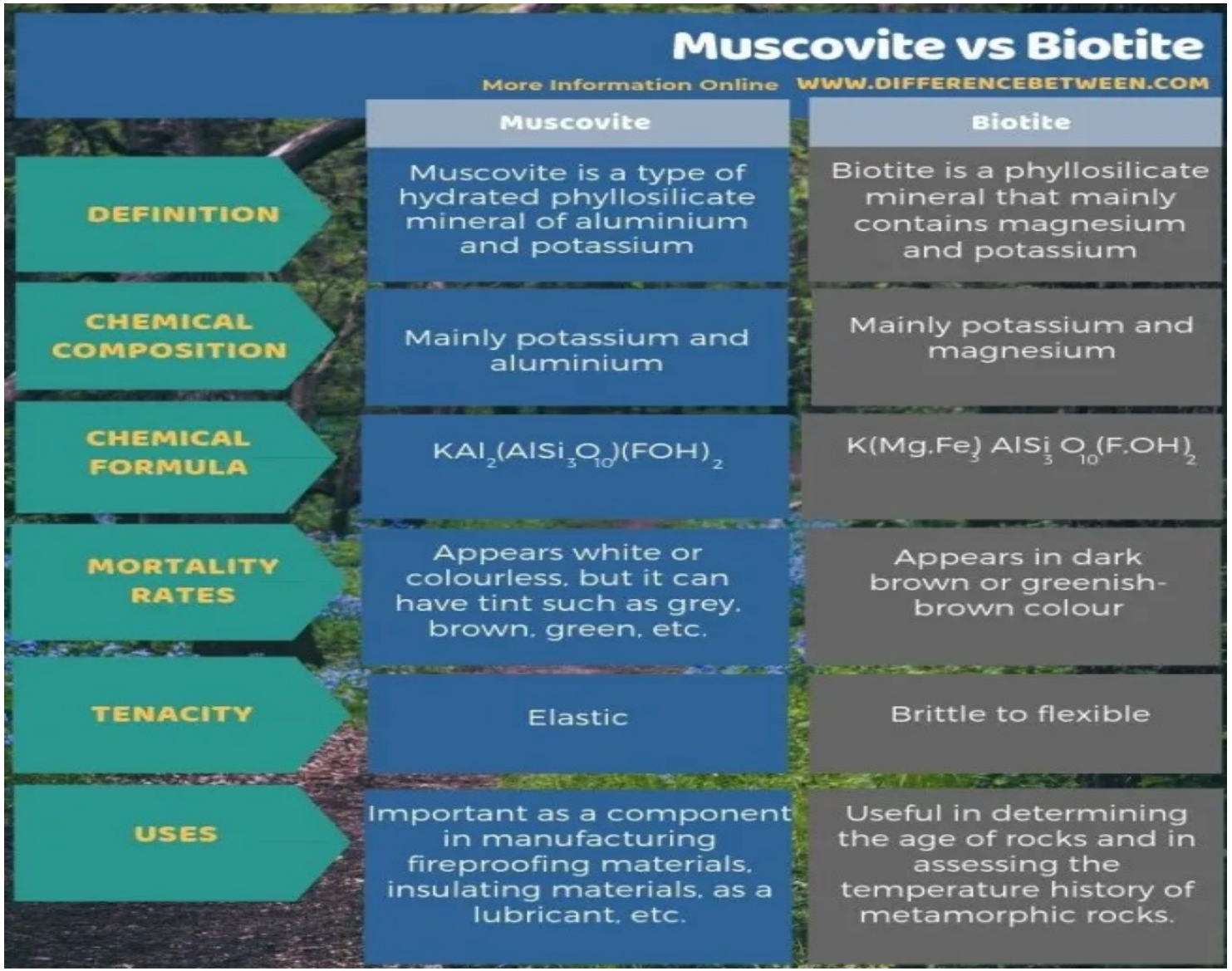
- It is one of the finest iron ores in the world and one of the most important pigment minerals as well.
- It is a dense and inexpensive material.
- It is also used for ballasts for ships.
- It is used as gemstones or in making jewellery as well.
- It can be used for its calming and protective properties.
- It is used as polishing compounds.
- Hematite is also kept in the homes because it gives great energy and the ability to get the mind to focus.

CLAY MINERALS

- Clay minerals are the major constituent of fine-grained sediments and rocks (mudrocks, shales, claystones, clayey siltstones, clayey oozes, and argillites).
- They are an important constituent of soils, lake, estuarine, delta, and the ocean sediments that cover most of the Earth's surface.

MICA

- The mineral has been known for millennia: Mica was first mined in India about 4,000 years ago, where it was used primarily in medicines.
- The Mayans used it for decorative effect in stucco to make their temples sparkle in the sun.
- Today it is used in everything from electrical products to makeup
- Mica is a generic name for a group of complex hydrous potassium-aluminum silicate minerals that differ somewhat in chemical composition; examples are biotite, lepidolite, muscovite, phlogopite, and vermiculite.


Muscovite vs Biotite
More Information Online WWW.DIFFERENCEBETWEEN.COM
Muscovite
Biotite
DEFINITION
Muscovite is a type of hydrated phyllosilicate mineral of aluminium and potassium
Biotite is a phyllosilicate mineral that mainly contains magnesium and potassium
CHEMICAL COMPOSITION
Mainly potassium and aluminium
Mainly potassium and magnesium
CHEMICAL FORMULA
$KAl_2(AlSi_3O_{10})(FOH)_2$
$K(Mg,Fe)_3AlSi_3O_{10}(F,OH)_2$
MORTALITY RATES
Appears white or colourless, but it can have tint such as grey, brown, green, etc.
Appears in dark brown or greenish-brown colour
TENACITY
Elastic
Brittle to flexible
USES
Important as a component in manufacturing fireproofing materials, insulating materials, as a lubricant, etc.
Useful in determining the age of rocks and in assessing the temperature history of metamorphic rocks.

CALCITE


Mohs Scale of Mineral Hardness
1-Talc
2-Gypsum
3-Calcite
4-Fluorite
5-Apatite
6-Feldspar
7-Quartz
8-Topaz
9-Corundum
10- Diamond
GeologyIn.com

Mohs relative hardness	Mineral example	Scratch test
1	Talc	Scratch with fingernail
2	Gypsum	Scratch with fingernail
3	Calcite	Scratch with copper penny
4	Fluorite	Easily scratch with knife
5	Apatite	Scratch with knife blade
6	Orthoclase	Scratch with steel file
7	Quartz	Scratch with window glass
8	Topaz	Scratches quartz
9	Corundum	Scratches topaz
10	Diamond	Scratches corundum

THANK YOU…