

## MINERALS

>A naturally occurring substance that has a definite chemical composition is called a mineral. Minerals are not evenly distributed through the earth. Minerals, rather than being scattered evenly through the area, are concentrated in different areas having varying amounts of mineral resources.

> Minerals vary in colour, density, hardness as chemical properties. It is these factors that allow the classification of minerals on the basis of these physical and chemical properties.

Requirements for Minerals to be met-

> Substances, in order to be recognized as minerals, have to meet the following criterion-

1. It should be a naturally formed substance- Minerals are always naturally formed substances. No mineral can be artificially created or produced, based on the technological progress of the world. Minerals take a very long time, usually millions of years to form naturally in the extreme conditions deep below the earth's crust.

2. It has to be inorganic- Minerals are always naturally formed, but inorganic substances. This implies that it should not have any carbon-hydrogen bonds in its composition.

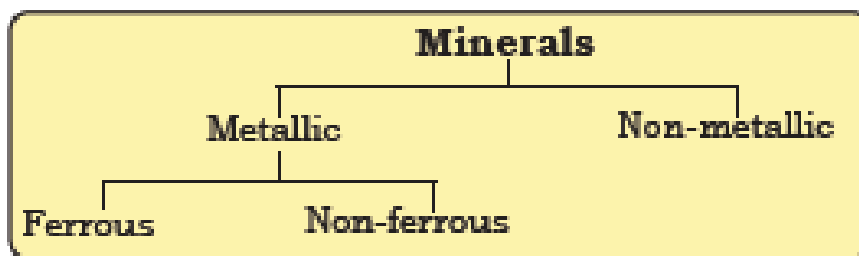
3. It has to be a solid- Minerals can never be found in any state of matter other than that of solids. It cannot be in liquid, gaseous or even in plasma state.

4. It has to have a characteristic crystalline structure- This means that minerals has to form naturally as a single solid substance. The material should be one, formed by natural processes.

5. It should have a specific composition- Minerals should have a specific composition, through which the mineral can be identified, and as such that the every part of the same mineral has the same composition.

### TYPES OF MINERALS

>There are over 3000 different minerals. On the basis of composition, minerals are classified, mainly as metallic and non metallic minerals.



*Fig. 3.2: Classification of Minerals*

#### 1. Metallic minerals-

Metallic minerals contain metal in raw form. Metals are hard substances that conduct heat and electricity and have a characteristic lustre or shine. Iron ore, manganese ore, bauxite are some examples.

Generally, metallic minerals are found in igneous and metamorphic rock formations that form large plateaus.

Iron ore in North Sweden, Copper and nickel deposits in Ontario, Canada, Iron, nickel, chromites in South Africa are some examples.

> Types of metallic minerals

1. Ferrous Minerals- These minerals, like iron ore, manganese and chromium contain iron. Ferrous minerals have magnetic properties.

2. Non Ferrous minerals- These minerals also contain metals but do not contain iron and are not magnetic, like gold, silver, copper, lead.

## 2. Non metallic minerals

Non metallic minerals do not contain metals and thus do not have metallic properties including lustre and shine, marked by their own chemical and physical properties. Examples of non metallic minerals are Limestone, Mica and Gypsum.

## EXTRACTION OF MINERALS

>Extraction of minerals is the process of retrieving minerals from the earth. Without extraction, minerals, although being valuable natural resources, would not be able to be used by humans.

> The processes involved in the extraction of minerals include Mining, Drilling and Quarrying. The two types of mining are Open cast mining and Shaft mining.

1. Mining- The process of taking out minerals from rocks buried under the earth is called mining.

Open Cast Mining- Minerals that lie at shallow depths are taken out by removing the surface layer, this is known as Open Cast

Mining. The depth of these mines can vary from 100 meters to 1 kilometer.

Shaft Mining- Deep bores, called shafts, have to be made to reach the minerals at great depths. This is called shaft mining. These mines can be a few kilometers deep, the deepest being 4 km.

### Consequences of mining

1. Negative impact on environment- Mining has caused deforestation, soil erosion, degradation of soil, climate alterations etc.
2. Unfavorable conditions of work- Many mines, like plantations used to employ forms of forced labour. While most countries restrict the freedom of corporations and agencies in doing so, it can still happen. For example, the mineral used in makeup, which is mica, has been found to be mined out by children and their families in areas as such that they have no choice but to accept the work which is hazardous and have killed their family members.

2.Drilling- Petroleum and natural gas occur deep below the earth's surface. Deep wells are drilled to take them out, this is called drilling.

3.Quarrying- Minerals lying near the surface are simply dug out through a process called quarrying.

## DISTRIBUTION OF MINERALS

> Minerals are found in all the continents on the earth. Among these, what stands out most is the mineral concentration of the continent Africa. Africa contains about 30% of the whole planet's mineral deposits. The continent contains 12% of the world's oil and 8% of the natural gas deposits. The continent also contains about 40% of gold and 90% of platinum and chromium reserves, both valuable metals. In being so, Africa is the most minerally-rich continent on the planet.

> Minerals occur in different types of rocks. Some are found in igneous rocks, some metamorphic and others in sedimentary rock. Sedimentary rock formations of plants and young fold mountains contain non metallic materials like limestone.

>Limestone deposits of Georgia and and Ukraine and phosphate beds of Algeria are some examples. Mineral fuels such as coal and petroleum are also found in the sedimentary strata.

## DISTRIBTUON OF MINERALS BY CONTINENTS

### >ASIA

The largest reserves of lead and zinc in Asia are located in the Kuznetsk Basin of Siberia and in central and eastern Kazakhstan. China also has abundant deposits of zinc and lead ores, and North Korea has important lead resources. China and India have large Iron Ore deposits and the continent produces over half of the world's tin. China also leads in the production of antimony and tungsten. Asia also has large deposits of copper, nickel and manganese.

## ➤ Europe

In Europe, Poland is the country with most minerals. The continent is the leading producer of iron ore in the world. The countries with large deposits of iron ore are Russia, Ukraine, Sweden and France. Mineral deposits of manganese and nickel are found in eastern Europe and European Russia. The EU is also a leading producer of silver and chromium. Only a few EU countries have active mines. They include **Austria, Finland, Greece, Ireland, Poland, Portugal, and Sweden**. In Europe, the country Switzerland has no known mineral deposits in it.

## ➤ North America

The mineral deposits in North America are located in three zones, the Canadian region north of the Great Lakes, the Appalachian region and the Mountain ranges of the west. In North America, **coal, iron ore, bauxite, copper, natural gas, petroleum, mercury, nickel, potash, and silver** have been found as mineral deposits. Iron ore, nickel, gold, uranium and copper are mined in the Canadian Shield Region, coal in the Appalachians region. Western cordilleras have vast deposits of copper ,lead ,zinc ,gold and silver.

## >South America

South America is **generally deficient in nickel, chromite (chromium ore), and cobalt**, although small quantities of all these minerals are found along with other industrial trace minerals in the central Andes of Peru, in several areas of eastern Brazil, and in the central and northern Argentine Andes.

Brazil is the largest producer of high grade iron ore in the world. Chile and Peru are the largest producers of copper. Brazil and Bolivia are among the world's largest producers of tin. South America also has large deposits of gold, silver,

zinc, chromium, manganese, mica, bauxite ,platinum, asbestos and diamond.

#### >Africa

Africa is rich in mineral resources. It is the world's largest producer of diamonds, gold and platinum. South Africa, Zimbabwe, and Zaire produce a large portion of the world's gold. The other minerals found in Africa are copper, iron ore, chromium, uranium, cobalt and bauxite. Oil is found in Nigeria, Libya and Algeria.

#### >Australia

Australia is the largest producer of bauxite in the world. It is the leading producer of gold, diamond ,iron ore, tin and nickel. It is also rich in copper, lead, zinc and manganese. Kalgoorlie and Coolgardie areas of western Australia have largest Deposits of gold. Australia also has large mineral sand deposits of ilmenite, zircon and rutile. In addition, Australia produces large quantities of black coal, manganese, antimony, nickel, silver, cobalt, copper and tin. **Mining occurs in all states of Australia, the Northern Territory and Christmas Island.**

#### ➤ Antarctica.

The geology of Antarctica is sufficiently well known to predict the existence of a variety of mineral deposits, Some probably large. Significant size of the deposits are in the Transantarctic Mountains and iron near the Prince Charles Mountains of East Antarctica is forecasted. Iron ore, gold, silver and oil are also present in commercial quantities. Scientific expeditions have found valuable minerals in some of these Antarctic areas, including **antimony, chromium, copper, gold, lead, molybdenum, tin, uranium, and zinc.** None approach a grade or size warranting

economic interest. Also noneconomic are the very large deposits of coal and sedimentary iron.

## ➤ OIL DISTRIBUTION

In 2021, **the majority of the oil worldwide was produced in the Middle East**, which accounted for around 31.3 percent of the global output that year. North America was the second largest oil producer, followed by the Commonwealth of Independent States.

Oil is one of the most valuable minerals in the world, renowned for transforming entire economies. A great example is the change that happened after oil was discovered in the middle east, which comprises mainly if Saudi Arabia followed by Iran and the smaller countries in the GCC which are UAE, Iraq, Israel, Bahrain, Qatar, Yemen, Algeria and more. Another great example is the transformation of the Venezuelan Economy which later faded out due to a variety of reasons including colonialism.

## ➤ Uses of Minerals

- Some minerals which are usually hard are used as gems for making jewellery.
- Copper is used in almost everything from coins to pipes.
- Silicon is used in almost everything from coins to pipes.
- Silicon is used in the computer industry which is obtained from quartz.
- Aluminum is used in automobile, airplanes, bottling industry, building and in kitchen cookware.
- Mica is used to make electrical appliances and glassmaking industries.
- Iron and steel is used in every industry.
- iron (as steel) in the framework of large building,
- clay in bricks and roofing tiles,
- slate for roofing tiles,
- limestone, clay, shale and gypsum in cement,



- gypsum in plaster,
- silica sand in window glass,
- sand and gravel and crushed rock as aggregates for fill and in concrete,
- copper for plumbing and wiring,
- clays for bathroom fixtures and fittings and tiles,
- paint may include pigments, extenders and fillers from mineral sources.

## CONSERVATION OF MINERALS

We are rapidly consuming mineral resources that require millions of years to be created and concentrated. Minerals can be conserved in the following ways:

- Reduce wastage in the process of mining.
- Recycling of metals using scrap metals.
- Use of alternative renewable substitutes.
- Use of mineral resources in a planned and sustainable manner
- Use of improved technologies to allow the use of low-grade ores at low costs.
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- Minerals are a finite resource that can only be replenished in a long span of time.. Controlling their usage and conserving minerals is critical for the future. Mineral conservation may be accomplished in three ways: **reduce, recycle, and reuse**.
- Continued extraction of ores leads to increasing costs of extraction and a decrease in quality as well as quantity.

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