# MINERAL AND POWER RESOURCES

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## INTRODUCTION

A mineral is a naturally occurring substance with a define chemical composition, having one or more elements. Minerals are found in the rocks. The uppermost layer of the earth is known as crust in which minerals are found buried abundantly

## CHARACTERISTICS OF MINERALS

Minerals provide raw materials to the industries. They are useful to man in various ways. Following are some of the characteristics of minerals.

(i) They are ubiquitous in nature, hence o\found everywhere

(ii) They are both organic and inorganic in nature. Coal, petroleum and natural gas are organic minerals whereas iron, copper, manganese, etc. are inorganic minerals.

(iii) Metallic minerals are not readily usable. They are found in the form of ores. An ore is an aggregate of minerals usually found in the rocks. From these ores metals are separated by heating or melting.

(iv) Minerals are very useful in our daily life. Their usage ranges from the utensils in which we eat the food to the car we drive.

(v) They are also used in electrical appliances. For example, wires and cables

(iv) Most of the minerals occurs in the crust of the earth but some are also formed very deep into the earth like petroleum and natural gas

## CLASSIFICATION OF MINERALS

Minerals differ in their structure, colour, hardness, solubility, etc. Hence they can be classified on the following bases :

### ◈ Metallic Content

◆ **Metallic Minerals :** Minerals from which we get metals like iron copper, gold, silver, lead,

aluminium, tin, etc are known as metallic minerals. These minerals have to be extracted from the ores in which they are present along with some other metals. Nowadays they are very precious and useful

- **Non-metallic Minerals :** Minerals which do not contain metals are known as non-metallic minerals. Coal, petroleum, nitrate, potash mica, gypsum are some of the non-metallic minerals. Although minerals are inorganic in nature but there are some which are organic in nature. Coal and petroleum are the minerals which originated from the plant and animal remains. These minerals produce heat and energy and hence called as fuels. They are also known as fuel minerals

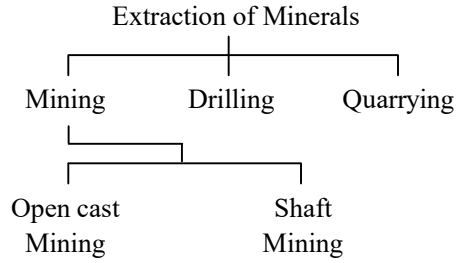
### ◈ Iron Content

Metallic minerals are further classified on the basis of content of Iron (Fe).

- **Ferrous Minerals :** Minerals which have iron content are known as ferrous minerals. These are iron, cobalt, nickel, manganese etc. They are basically used in iron and steel industries. They are grayish in colour.
- **Non-ferrous Minerals :** Minerals which do not have iron content are referred to as non-ferrous minerals. For example, gold, copper, tin and aluminium. They are found in all types of rocks.

## ➢ EXTRACTION OF MINERALS

The process of taking out minerals from rocks buried under the earth's surface is called **mining** Minerals that lie at shallow depths are taken out by removing the surface layer, this is known as **open-cast mining**




Deep bores, called shafts, have to be made to reach minerals deposits that lie in great depth This is called **shaft mining**. Petroleum and natural gas occur far below the earth's surface. Deep wells are bored to take them out, this is called drilling. Minerals that lie near the surface are simply dug out, by the process known as quarrying.

## ➢ DISTRIBUTION OF MINERALS

(i) Minerals occur in different types of rocks.

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

(iii) Iron-ore in North, Sweden, copper and nickel deposits in Ontario, Canada, Iron, Nickel, Chromites and platinum in South Africa are examples of minerals found in igneous and metamorphic rocks

(iv) Sedimentary rock formation of plains and young fold mountains contains non-metallic minerals like limestone.

(v) Limestone deposits of Caucasus region of France, manganese deposits of Georgia and Ukraine and phosphate beds of Algeria are some examples.

(vi) Mineral fuels such as coal and petroleum are also found in the sedimentary strata.

## ➢ WORLD-DISTRIBUTION OF MINERALS

### ◈ Asia

China and India have large iron ore deposits. The continent produces more that half of the world's tin. China, Malaysia and Indonesia are among the worlds leading ten producers. China also leads in production of lead, antimony and tungsten . Asia also has deposits of manganese, bauxite, nickel, zinc and copper.

### ◈ Europe

Europe is the leading producer of iron-ore in the world. The countries with large deposits of iron ore are Russia, Ukraine, Sweden and France Minerals deposits of copper, lead, zinc, manganese and nickel are found in eastern Europe and European Russia.

### ◈ North America

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 :

Brazil is the largest producer of high grade iron – ore in the world. Chile and Peru are leading 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. Bauxite, mica, platinum, asbestos and diamond Mineral oil is found in Venezuela, Argentina, Chile, Peru and Columbia.

### ◈ Africa :

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 Angola.

### ◈ Australia :

Australia is the largest producer bauxite in the world. It is a leading producer of gold, diamond, iron ore, tin and nickel. It is also rich in copper, lead zinc and manganese. Kalgoorlie and coolagardie areas of western Australia have the largest deposits of gold.

### ◈ Antarctica :

Significant size of deposits of coal 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.

### ◈ Distribution in India

- **Iron :**

  India has deposits of high grade iron ore. The mineral is found mainly in Jharkhand. Orissa, Chhattisgarh, Madhya Pradesh, Goa, Maharashtra and Karnataka.

- **Bauxite :** Major bauxite producing areas are Jharkhand. Orissa, Chhattisgarh, Madhya Pradesh, Gujrat, Maharashtra and Tamil Nadu

- **Mica :** Mica deposits mainly occur in Jharkhand. Bihar, Andra Pradesh and Rajasthan, India is the largest producer and exporter of mica in the world.

- **Copper :** It is mainly produced in Rajasthan, Madhya Pradesh, Jharkhand, Karnataka. and Andra Pradesh.

- **Manganese :** India's manganese deposits lie in Maharasthtra, Madhya Pradesh, Chhatisgarh, Orissa, Karnataka and Andhra Pradesh.

- **Limestone :** Major limestone producing states in India are Bihar, Jharkhand, Orissa, Chhattisgarh, Madhya Pradesh, Rajasthan, Gujarat and Tamil Nadu

- **Gold :** Kolar in Karnataka are among the deepest in the world which makes mining of this ore a very expensive process.

- **Salt :** It is obtained from seas, lakes and rocks. India is one of the world's leading producers and exporters of salt

## ➢ USES OF MINERALS

Minerals are used in many industries. Minerals which are used for gems are usually hard. These are then set in various styles for jewellery. Copper is used in everything from coins to pipes, Silicon, used in the computer industry is obtained from quartz. Aluminium obtained from its ore bauxite is used in automobiles and airplanes, bottling industry, buildings and even in kitchen cookware.

## ➢ CONSERVATION OF MINERALS

Minerals are a non-renewable resource. The rate of formation is much smaller than the rate at which the humans consume these minerals. It is necessary to reduce wastage in the process of mining Recycling of metals is another way in which the mineral resources can be conserved.

**Ways to conserve minerals :**

**(i) Recycling –** It means using discarded materials once again. Many metals like iron, gold, copper and aluminium become reusable through recycling.

**(ii) Avoid Wastage –** Minerals can be conserved by using efficient methods of extraction and processing and by avoiding wastage. Saving can be done at consumption level also

**(iii) Substitutes –** In recent years biodegradable plastics and other substitutes have been used to conserve mineral resource.

## ➢ POWER RESOURCES

The sources of power which are in common use for a long time are called the conventional sources of power. These include firewood, coal, petroleum, natural gas and electricity.

## ➢ THE CONVENTIONAL SOURCES OF POWER

### ◈ Firewood

The most important single use of wood from the forest is as fuel. Most of the people living in under-developed countries use wood for domestic cooking and for heating. In India, most of the tribals and those living in villages use firewood as the main source of fuel. Most of the tropical countries have a high consumption of firewood.

### ◈ Fossil Fuels

Millions of years ago, the remains of plants and animals were buried under the earth by the forces of nature. The large amount of heat and pressure inside the earth converted these remains in fossil fuels, such as coal, petroleum and natural gas. These are the main sources of conventional energy. The reserves of the fossil fuels are finite and limited. Their consumption is rapidly increasing in the modern world than their rate of formation. Thus one day or the other, the fossil fuels are likely to be exhausted. They cannot be replenished like commodities derived from plant and animal kingdoms. Thus, we must develop alternative sources of power

### ◈ Coal

Coal was used for centuries to provide heat for domestic uses. In the 18th century, it was used to produce steam power and thus became the basis of Industrial Revolution. Coal remained the most efficient fuel for running factories and railway locomotives. It is also used to generate electricity, which is called **thermal electricity**. The coal which we mine and use today was actually formed millions of years ago under the surface of the earth where the vegetal material grew luxuriantly in bogs and swampy areas. It was embedded between the layers of sand, silt and clay. Coal is categorised in four varieties. These are **peat,**

**lignite, bituminous** and **anthracite.** It is based on the carbon contents and the amount of impurities present in them.

The coal mining methods are influenced by (i) nature of coal occurrence, (ii) thickness of the coal seams, (iii) the type of coal and (iv the mode of operation. Basically, coal is mined either on the surface or underground with minor variations according to locality.

The main coal producing countries in the world are China, USA, Russia, Germany, Poland, UK, South Africa and India. The Jharkhand state is the important producer of coal in India. The main centres of coal in India are Raniganj, Jharia, Dhanbad and Bokaro.

### ◈ Petroleum

Petroleum or mineral oil was in use from ancient times in Iraq and Egypt. The modem petroleum industry came into being only after 1859 AD when the first oil well was drilled in Pennsylvania (USA). The mineral oil is found in the sedimentary rocks. The crude oil is taken out by drilling wells in the oilfields. On refining, the crude oil gives us a large variety of products, such as **petrol, diesel, kerosene, wax, plastic, lubricant, etc.** Because of their value in our daily life, the crude petroleum is known as **Black Gold.**

More than half of the total reserves of petroleum are located in Middle-East countries of Asia. Saudi Arabia has the largest reserves of oil. The main petroleum producing countries are Saudi Arabia, Iran, Iraq, Qatar, UAE, USA, Mexico, China, Venezuela, UK, Nigeria, Kuwait, Libya, Russia, Indonesia and India. In **India,** the main oil-producing regions are Digboi in Assam, Mumbai High of Mumbai, Gujarat and the deltas of Krishna and Godavari rivers.

### ◈ Natural gas

It is found associated with mineral oil in most of the oilfields. It gets released when the crude petroleum is drilled and taken out from the oilfields. Previously, this gas was allowed to go waste. Now, it is being used as domestic and industrial fuels. The main producers of natural gas are Russia, USA, Netherlands, China, Iran, UK and India. Today, USA is not only the largest producer, but also the largest consumer of natural gas. In India, efforts are being made to discover the new reserves of natural gas. The important natural gas producing regions in India are Gujarat, Tamil Nadu and the Krishna-Godavari region.

### ◈ Hydel Power

The force of running water has been used for a long time to drive paddle wheels. The invention of turbine and the dynamo has made it possible to use hydropower to generate electricity. The source of hydropower is inexhaustible. The amount of energy in running water depends upon the volume of water and the velocity of the current. The water discharged from the turbine after the generation of hydroelectricity is used for irrigating the farmland. The leading producers of hydroelectricity in the world are USA, Canada, Russia, China, India, Sweden, UK, New Zealand, Australia and South Africa. In India, a large number of multipurpose projects have been developed across the rivers not only for generating hydroelectricity, but also for the overall development of the river basin. Find out the names of such multipurpose projects.

## ➢ THE NON-CONVENTIONAL SOURCES OF POWER

Less than 200 years ago, most of the people in the world used wood to cook food and to heat homes. One way, the world has changed in the last 200 years is in the amount of energy it

consumes. Almost all this energy comes from the fossil fuels, which cannot be replaced. The world is already facing the shortage of fossil fuels. Thus, there is a need for the increasing use of non-conventional sources of energy, such as **solar energy, wind energy, nuclear energy, geothermal energy, tidal energy, biogas,** etc.

### ◈ Solar Energy

The sun radiates an enormous amount of energy. If a small portion of that energy could be captured and converted into electricity, all the earth's energy needs would be satisfied cheaply, easily and without any damage to the environment. The sunlight can be changed into electricity with the use of solar cells which are made mostly of silicon. This can help tropical countries, where there is enough sunshine. But, the solar cells are very expensive.

### ◈ Wind Energy

The power of the wind has been used for centuries to drive mills and pumps. The wind power can be used to move the blades of windmills. Some windmills run generators to produce electricity. Now, **wind farms** have been established in many parts of the world. They have a number of windmills in a small area. The windmills work best on tops of mountains, along sea coasts and in open plains; where strong and steady wind blows. The main countries which have developed the technology for producing energy on large-scale are Netherlands, Germany, Denmark, UK, USA, Spain, India, etc.

### ◈ Nuclear Energy

Nuclear energy is produced when we make changes in the nucleus of the atom. Energy is produced when the nucleus splits into two or more smaller nuclei in the process, called **fission**. The atom used in the fission process comes from uranium or thorium. The nuclear fission can take place in **nuclear reactors**. The waste produced by the nuclear power plants is radioactive and dangerous. The first nuclear plant was set-up in UK in 1956. Now, the nuclear energy is widely produced in USA, UK, Russia, Japan, China, Germany, France, Canada, Australia, Sweden, India, etc

### ◈ Geothermal Energy

It is the energy that comes from heat produced within the interior of the earth. The heat may come from magma or molten rocks in the crust. This can heat the groundwater to manifest **hot springs** or **geysers**. This can be used to heat houses. The steam can also be used to run generators. The geothermal energy is widely used in Iceland. The other main users are USA, New Zealand, Italy, Philippines and Central America.

This energy is freely available and causes little or no pollution when electricity is generated from it.

### ◈ Tidal energy

The energy produced by the rise and fall of water due to the tides is called the **tidal energy**. A dam is used to trap water at high tide and is released at the time of low tide. The plant rising and falling water can run generators and produce electricity. Few countries, such as Russia, France, UK and India have developed the **tidal mill farms**.

### ◈ Biogas

The gaseous fuel, called biogas, can be obtained from the organic wastes, which include dead plants, animal dung and kitchen waste. Biogas is a mixture of methane and carbon dioxide gases. These gases are released due to the decomposition of organic wastes. These can also produce **organic manure**.

These gases can be used for cooking, heating and lighting.

## ➢ CONSERVATION OF SOURCES OF ENERGY

(i) Conservation is possible by making use of renewable sources of energy

(ii) Use energy in a planned way

(iii) Burning of waste to generate power

(iv) General increase in power efficiency of machinery and appliances.

(v) Increase in power station efficiency.