

6. SEDIMENTATION ORE DEPOSITS

Sedimentary rocks with valuable mineral deposits like iron, manganese, copper, phosphate, coal, oil shale, limestone, clay, sulphur etc. are formed due to the process of sedimentation. Sedimentation deposits are the syngenetic ore deposits which are formed at the same time as the enclosing rock. They occur as beds in the sedimentary rocks. These substances are made up of inorganic and organic materials and their source is the other rocks which have undergone disintegration. Some of the materials like oxygen and carbon-dioxide may have been obtained from atmosphere. Besides source materials, the other factors responsible in resulting sedimentary deposits are gathering of materials by solution, their transportation and deposition at suitable sites.

PROCESS:-

The process may be summarized as follows-

1. During weathering, the materials are released from the source rock. In this process the valuable mineral constituents are taken into solution. The chief solvents are carbonated water, organic acids and sulfate solutions.
2. Most of the valuable substances are transported either in suspension or in solution by means of river water to the sea.
3. In the sea, the valuable material is deposited mechanically, chemically or biologically. The chemical precipitation of materials in solution is controlled largely by the pH and Eh of the

environment. The pH is responsible for the acidic or alkaline conditions and the E_h for the oxidation reduction potential.

FEATURES OF SEDIMENTARY DEPOSITS

1. They commonly show bedding planes, ripple marks and other sedimentary structures.
2. They normally occur as a bedded sedimentary rock interstratified between rocks of sedimentary origin.
3. They are often a deposit of great geographical extent.

7. EVAPORATION DEPOSITS

Many nonmetallic mineral deposits are formed as a result of evaporation of shallow and isolated bodies of saline water. The chief minerals which occur as evaporation deposits are common salt, gypsum, and other salts of K, Ca, Na and Mg. The process of evaporation may briefly be summarized as follows—

- i) The main source of the evaporation deposits is sea water.
- ii) When a body of sea water is cutoff during oscillations of land and sea its water evaporate. This leads to the concentration of soluble salts.
- iii) When supersaturation of a salt is reached, that salt is precipitated and thus evaporation deposits are formed.

- iv) The evaporation deposits are mostly formed in warm arid climates where evaporation proceeds very rapidly.

8. ~~EXHAUSTION~~ RESIDUAL DEPOSITS

Residual ore deposits are formed as a result of weathering of rocks and enclosed mineral deposits. The economic minerals which commonly occur as residual deposits are iron, manganese, bauxite, clay, ochre, tin, kyanite etc.

During weathering the rocks undergo chemical decay. In this process the under undesirable constituents are removed in solution leaving behind a concentration of valuable minerals at the site of the original rock. The conditions necessary for the formation of residual mineral deposits are as follows—

- i) The rock undergoing weathering must contain some valuable minerals.
 - ii) The valuable minerals must be resistant to chemical weathering.
 - iii) The outcrop surface should have low relief so that gravity and running water can not remove insoluble products of weathering.
 - iv) There should be adequate rain to carry away in solution the soluble products of weathering.
- Hence residual deposits commonly develop in tropical or subtropical climate.

Ex-① Residual liquid segregation - Titaniferous magnetite bands of Bushveld complex.

① Residual liquid injection - Titaniferous magnetite deposits in Adirondack region of New York.

9. MECHANICAL CONCENTRATION DEPOSITS

The natural separation of heavy minerals from light ones by means of moving water, air or gravity, is called mechanical concentration. The mineral deposits formed by this process are called 'placers'. The minerals which commonly occur as placer deposits are diamond, gold, platinum, tin stone, magnetite, chromite, ilmenite, and monazite.

The process of mechanical concentration may be summarized as follows-

- i) The ore minerals are released from the rock by weathering and disintegration.
- ii) The disintegrated materials are carried downslope by water, air etc. Ultimately this material reaches the stream or sea shore.
- iii) In the moving water or air, the heavier placer minerals sink to the bottom while the lighter material is carried further. Thus the heavier minerals are separated from the lighter ones.
- iv) In this way the heavy minerals get concentrated in particular localities to form placer deposits.

PLACER DEPOSITS

Conditions necessary for the formation of a placer deposit are-

- i) There must be a primary source, such as an ore deposit, a dissemination deposit, or a low grade deposit which supplies ore minerals.
- ii) Must be exposed to weathering on a slope from where the disintegrated material may be carried

- away by water, air.
- iii) One mineral in the deposit must be of such chemical composition that it can resist weathering.
 - iv) For a mineral to be concentrated as a placer deposit, it must have a higher density than the worthless material with which it occurs.

FACTORS AFFECTING FORMATION OF PLACER DEPOSITS

- i) Specific gravity of minerals.
- ii) Specific surface of the particles.
- iii) Shape of the particles.
- iv) The ability of a body of flowing water to transport the particles and the viscosity of the transporting medium.

TYPES OF PLACER DEPOSITS

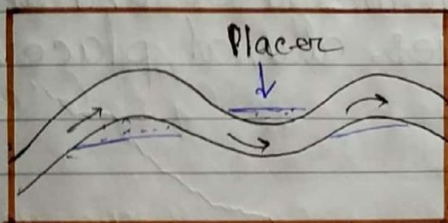
The placer deposits have been divided into four groups.

- i) Eluvial placers.
- ii) Stream placers.
- iii) Beach placers.
- iv) Eolian placers.

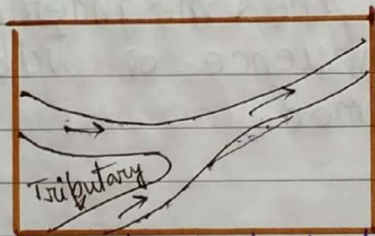
A) **ELUVIAL PLACERS** :- Placer deposits along hill slopes are formed due to weathering and erosion of the country rocks containing low-grade deposits of the desired materials and are known as eluvial placers. Here the mineral concentration is caused by gravity. When the debris produced due to weathering of rocks, moves downslope, the heavier particles move more slowly than lighter ones.

B) STREAM PLACERS: These occur at various places along the stream. Here the mineral concentration is caused by running water. The weathered rock material travels with stream water. The concentration of heavier minerals occurs in those places where the velocity of water slackens. The places where stream placers are found, are as follows—

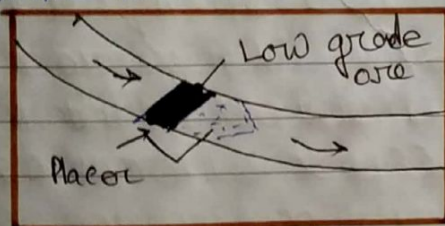
- i) In pot holes and plunge pools which form at the base of waterfalls and rapids.
- ii) In the sand bars which occur at the inner curves of meanders.
- iii) Just downstream to the junction of a tributary to the main river.
- iv) On the river bed in the vicinity of a low grade deposit.
- v) In the ripples, streams flowing across vertically or steeply inclined beds may have uneven floors. Such a floor forms a 'riffles'.



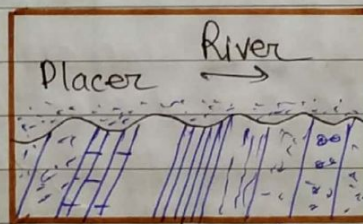
In the Inner curves of Meandering



Downstream of a Junction of a tributary



In the vicinity of a low grade deposit



In the Riffles

STREAM PLACERS

C) BEACH PLACERS: These deposits occur along sea shores where mineral concentration is caused by wave action. Beach sands of Kerala contain important deposits of monazite and ilmenite.

- D) **EOLIAN/AOLIAN PLACERS** := These occur in arid regions where mineral concentration is caused by wind action. Eolian placers are found in Australia.
- E) **DELUVIAL PLACES** := When the weathered and disintegrated material is shifted down hills deluvial (scree or talus) placers are formed.
- F) **PROLUVIAL (COLLUVIAL) PLACERS** := Accumulation of the material at the foot of a slope can lead to the development of proluvial placers.
- G) **ALLUVIAL PLACERS** := Running water is the most important agency in the formation of alluvial placers. Irregularities on the floor of the channel in the form of natural barriers or riffles encourage deposition of placers deposits. Besides, at the meanderings of the river and at the confluence of tributaries, alluvial placers are formed.