

Origin of Mineral Deposits

➤ classified on the basis of what concentrated the valuable substance. Examples Include:

- 1) ***Hydrothermal Mineral Deposits***
- 2) ***Magmatic Mineral Deposits***
- 3) ***Sedimentary Mineral Deposits***
- 4) ***Placer Mineral Deposits***
- 5) ***Residual Mineral Deposits***

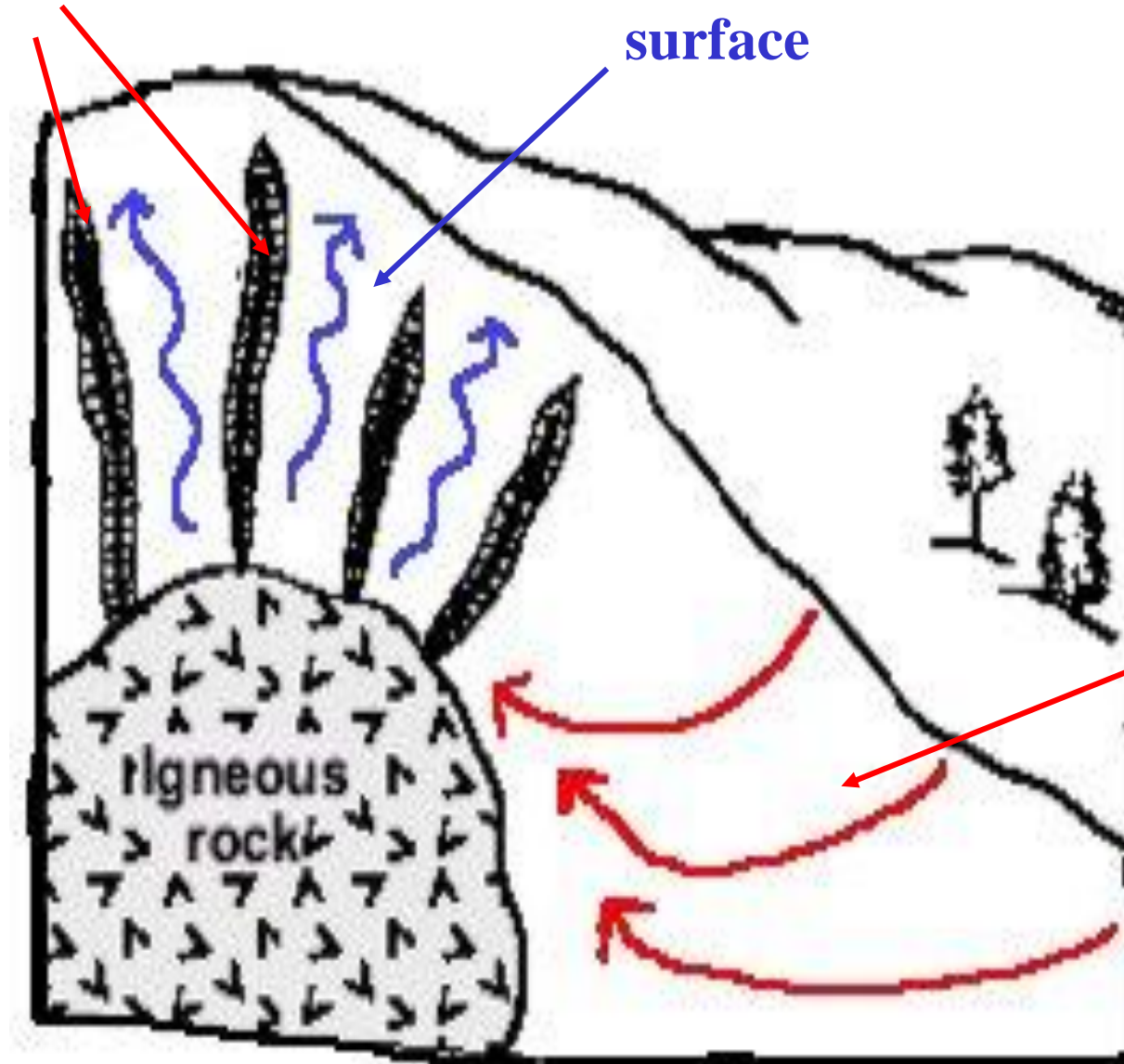
Reference: Tarbuck
and Lutgens Pages
583-597
CD 78

1) Hydrothermal Mineral Deposits

- Minerals are concentrated by hot fluids flowing through fractures and pore spaces in rocks.
- Hydrothermal deposits are produced when groundwater circulates down to depths and heats up, either by magma or because of the geothermal gradient. (30 °C per km depth)
- Such hot water can dissolve valuable minerals as it goes through the rock
- When the water goes into cooler areas of the crust, the dissolved substances are precipitated out of solution.

**Ore minerals
depositing in veins**

**Cooler water
moving toward
surface**

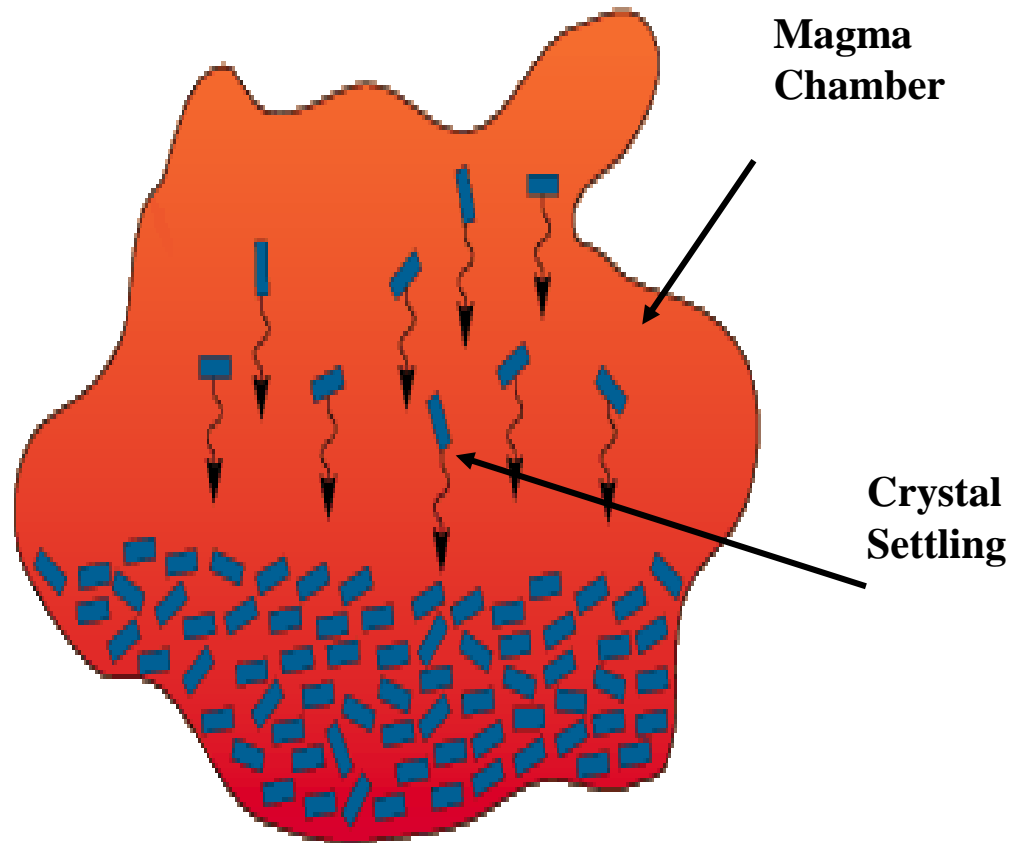


**Hot water
moving at
depths**

2) Magmatic Mineral Deposits

➤ Minerals are concentrated within a body of igneous rock by magmatic processes like crystal settling.

➤ As they crystallize from a magma body, heavy mins may sink to the bottom of the magma chamber. Thus, the concentration



3) **Sedimentary Mineral Deposits**

- Minerals are concentrated by chemical precipitation from lake or sea water.

Examples Include:

- 1) **Evaporite Deposits-** you already know it

- 2) **Iron Formations** - iron rich mineral deposits from marine environments during the Proterozoic. Formed by iron-rich waters reacting with oxygen released by algae. The composition of sea water must have been drastically different than it is today.

4) **Placer Mineral Deposits**

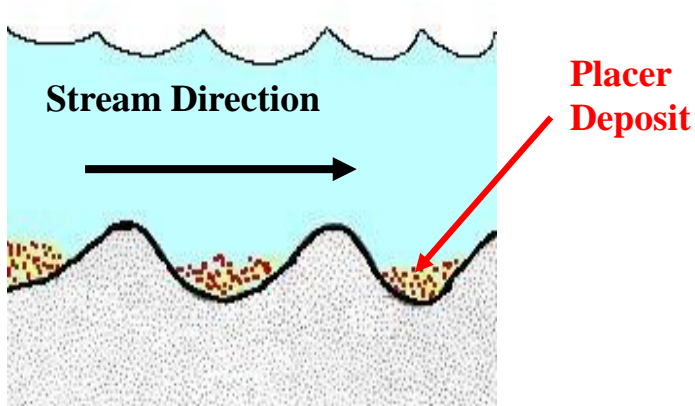
- Minerals are concentrated by flowing surface waters depositing high density minerals either in streams or along coastlines when the water slows.
- Heavy minerals (gold, diamond, and magnetite) will be concentrated in areas where water current velocity is low. The lighter minerals (quartz) are carried away.

Gold

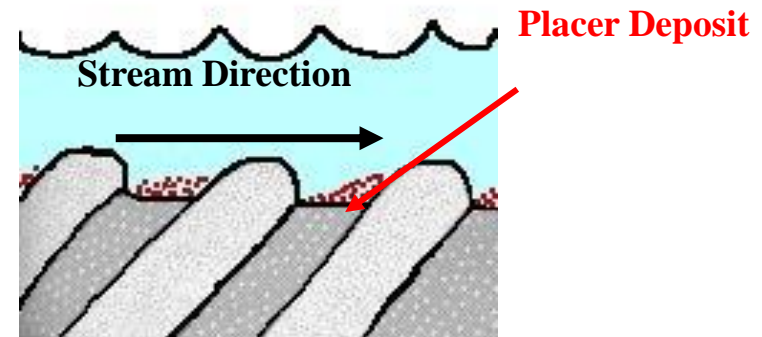
- formed in hydrothermal veins
- eroded out of the veins and carried in streams where it was deposited in placer deposits.
- The California gold rush in 1849 began when someone discovered rich placer deposits of gold in streams.

Where they form:

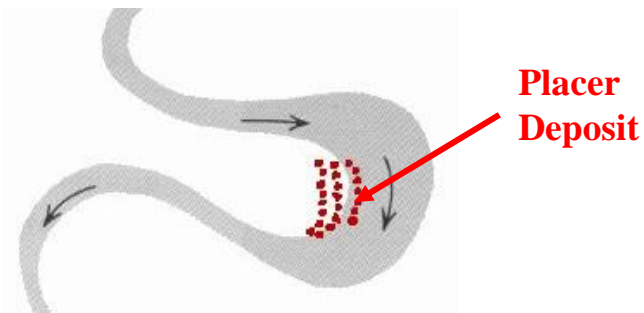
1) between ripple marks



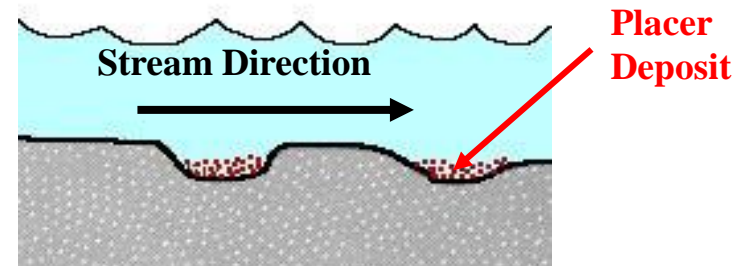
2) behind rock bars



3) on the inside of meandering streams



4) in holes on the bottom of a stream

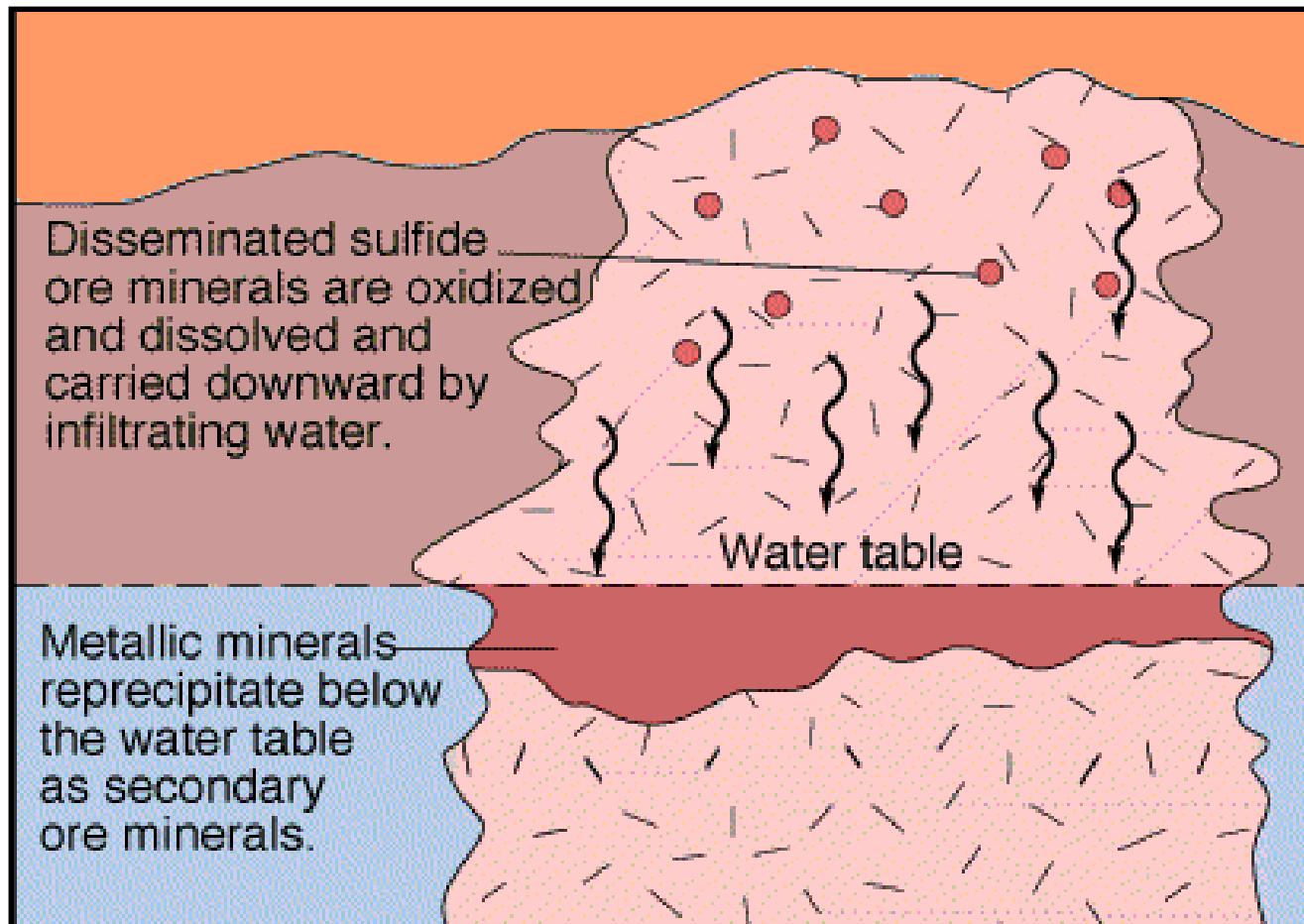


5) Residual Mineral Deposits

- Minerals are concentrated by chemical weathering processes.
- warm tropical climates that receive high temperatures and high amounts of rainfall which produces highly leached soils rich in both iron and aluminium.
Chemical weathering tends to remove the soluble materials, leaving the less soluble residues.
- Two common are: iron-rich **Limonite** and aluminium-rich **Bauxite**.
Bauxite is the world's primary source of aluminium.

5) Residual Mineral Deposits

- In addition, an existing mineral deposit can be turned in to a more highly concentrated mineral deposit by weathering in a process called secondary enrichment.



Sample Problem

Distinguish between hydrothermal and depositional methods of the formation of economic mineral deposits.

Answer:

Hydrothermal - hot solutions react with rocks in which they pass and as a result the hot solutions becomes concentrated with metals in solution. When the hot solution enters a cooler environment, the metals precipitate from the solution and form metallic mineral deposits. Ex. gold in quartz.

Depositional - form by a process of sedimentation. Mineral deposits form as a result of chemical precipitation, evaporation, and density deposits in water environments. Ex. gypsum and halite deposits or gold accumulating in water environments as placer deposits.