

### Key definitions

<b>Ore body</b>	A natural concentration of economically valuable metallic minerals, e.g. copper, gold and tin.
<b>Gangue</b>	The low value, waste mineral portion of an ore, e.g. quartz, calcite and pyrite.
<b>Resource</b>	A valuable natural economic deposit.
<b>Reserve</b>	The economically valuable proportion of a resource that can be extracted using current technology.
<b>Grade</b>	The percentage concentration of valuable minerals.

### Sedimentary associations

The processes of weathering/erosion, transport and deposition leads to concentration of natural resources.

- **Residual deposits** - deep chemical weathering removes soluble rock leading to the surface concentration of insoluble residues, e.g. bauxite.
- **Precipitated:**
  - BIFs** - Precambrian atmosphere and ocean was oxygen deficient. Ferrous iron ( $Fe^{2+}$ ) is oxidised to insoluble ferric iron ( $Fe^{3+}$ ) by photosynthetic bacteria, which is precipitated in layers (banded iron formation).
  - Evaporites** - shallow seawater bodies evaporate to precipitate salts, e.g. halite and gypsum.
- **Placer deposits** - concentration by gravity sorting of valuable, hard, dense, stable minerals, in lower flow regimes of moving water during sediment transport, e.g. gold.

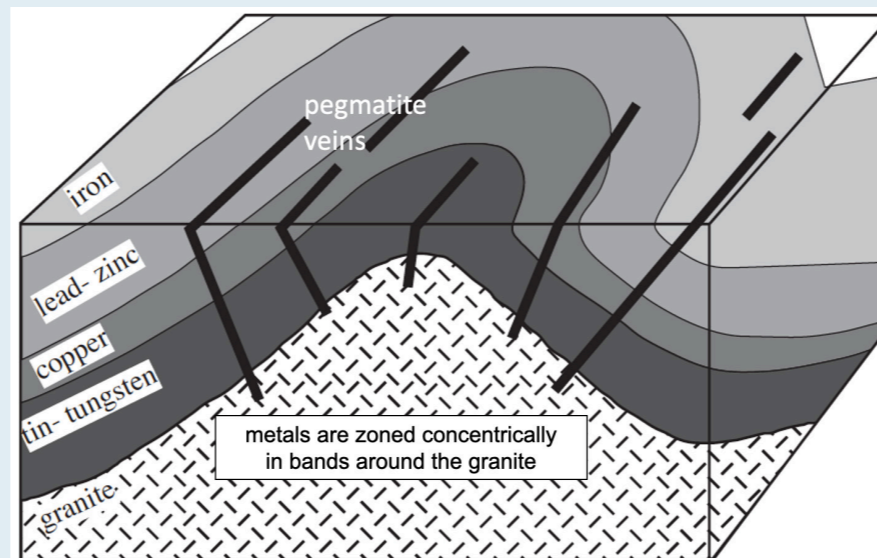
### Igneous ore associations

Valuable elements are poorly distributed in the crust and require natural processes to concentrate them to economically viable levels if they are to be exploited.

- Cumulate deposits, e.g. iron chromite ores
- Massive sulphide ores, e.g. black smokers
- Hydrothermal ores, e.g. porphyry copper

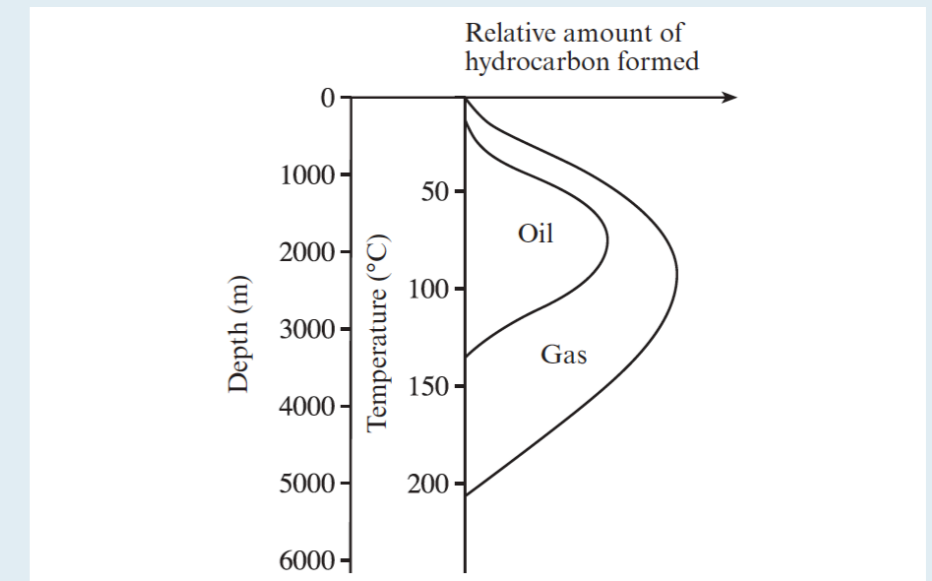
### Hydrothermal metallic deposits

- These are associated with granite intrusions at convergent plate boundaries.
- Hydrothermal fluids (copper-rich) rise from the top of magma chambers to be intruded into country rock as mineral veins.
- Fluids chemically alter the country rock to form concentric alteration zones around the granite according to temperature.
- Pegmatite veins - from highly volatile enriched fluids forming very coarse crystals of valuable rare elements, e.g. tin and lithium.



### Hydrocarbons: oil and natural gas

Oil and gas result from the thermal alteration of buried organic material under specific depth conditions (temperature/pressure).



### Coal

Coal forming environments - an increase in coal rank (% carbon/volatiles) results in peat, lignite, bituminous and anthracite.

### China clay

Felspars in granite break down by chemical weathering (hydrolysis) to clay - kaolinite.

### Bulk minerals

Sand and gravel - important bulk minerals for aggregates in the construction industry. Deposition in a range of environments: river, river terrace, glacial/fluvioglacial and beach.