Classification of Ore Deposits

Akhil Kumar Dwivedi

Assistant Professor

MLSU

Classification of Ore Deposits

Beck, 1904	Bergeat — Stelzner, 1904	Irving, 1908
I. Primary.	I. Protogene.	I. Bedrock deposits.
A. Syngenetic.	*A*. Syngenetic.	*A*. Syngenetic.
1. Magmatic segregations.	1. With eruptive rocks.	1. Igneous.
2. Sedimentary ores.	2. With sedimentary rocks.	2. Sedimentary.
B. Epigenetic.	*B*. Epigenetic.	*B*. Epigenetic.
1. Veins.	1. Cavity fillings.	1. Cavity fillings.
2. Epigenetic deposits not veins.	2. Replacements.	2. Replacements.
		3. Contact-metamorphic deposits.
II. Secondary.	II. Secondary.	II. Disintegration deposits.
A. Residual.	*A*. Residual.	*A*. Mechanical.
B. Placers.	*B*. Placers.	*B*. Chemical.

Classification of Ore Deposits

A genetic scheme formerly used by the author was a modification of the 1908 classification by J. D. Irving, as follows:

I. Bedrock deposits.
- *A*. Syngenetic deposits: (1) igneous; (2) sedimentary.
- *B*. Epigenetic deposits.
  1. Cavity fillings: (*a*) fissure veins, (*b*) shear zones, (*c*) ladder veins, (*d*) stockworks, (*e*) saddle-reefs, (*f*) tension-crack fillings, (*g*) solution cavity fillings (caves, channels, gash veins), (*h*) breccia fillings, (*i*) pore-space fillings, (*j*) vesicular fillings.
  2. Replacement deposits: (*a*) massive, (*b*) lode, (*c*) disseminated.
  3. Contact-metamorphic deposits.

II. Disintegration deposits.
- *A*. Mechanical. *B*. Residual. *C*. Chemical.

Lindgren's classification (1911)

	Temperature °C	Pressure
I. Deposits by Mechanical Processes.		
II. Deposits by Chemical Processes.		
A. In surface waters.		
1. By reactions.	0–70	Medium to high
2. Evaporation.		
B. In bodies of rocks.		
1. Concentrations of substances contained within rocks:		
a. By weathering.	0–100	Medium
b. By ground water.	0–100	Medium
c. By metamorphism.	0–400	High
2. By introduced substances.		
a. Without igneous activity.	0–100	Medium
b. Related to igneous activity.		
(*a*) By ascending waters.		
(1) Epithermal deposits.	50–200	Medium
(2) Mesothermal deposits.	200–300	High
(3) Hypothermal deposits.	300–500	High+
(*b*) By direct igneous emanations.		
(1) Pyrometasomatic deposits.	500–800	High+
(2) Sublimates.	100–600	Low to medium
C. In magmas by differentiation.		
1. Magmatic deposits.	700–1500	High+
2. Pegmatites.	575 ±	High+

Schneider-hohn classification (1932)

DEPOSITS OF ORIGIN DEPENDENT UPON THE ERUPTION OF IGNEOUS ROCKS

A. Hydrothermal deposits.
- *a*. Epithermal.
- *b*. Mesothermal.
- *c*. Hypothermal.

B. Emanation deposits.
- *a*. Sublimates.
- *b*. Exudation veins, surface type.
- *c*. Pyrometasomatic deposits.
- *d*. Exudation veins, deep-seated type.

C. Magmatic deposits.
- *a*. Orthotectic.
  1. Differentiation *in situ*.
  2. Injected.
- *b*. Pneumotectic.
  1. Differentiation *in situ*.
  2. Injected.

Classification of Ore Deposits

Lindgren's Classification of Ore Deposits (modified from Lindgren 1933; Evans 1993)

	Depth	Temperature (°C)	Occurrence	Metals
Telethermal	Near surface	±100	In sedimentary rocks or lava flows; open fractures, cavities, joints. No replacement phenomena	Pb, Zn, Cd, Ge
Epithermal	Near surface to 1.5 km	50–200	In sedimentary or igneous rocks; often in fault systems; simple veins or pipes and stockworks; little replacement phenomena	Pb, Zn, Au, Ag, Hg, Sb, Cu, Se, Bi, U
Mesothermal	1.2–4.5 km	200–300	Generally in or near intrusive igneous rocks; associated with regional faults; extensive replacement deposits or fracture fillings; tabular bodies, stockworks, pipes	Au, Ag, Cu, As, Pb, Zn, Ni, Co, W, Mo, U etc.
Hypothermal	3–15 km	300–600	In or near deep-seated felsic plutonic rocks in deeply eroded areas. Fracture-filling and replacement bodies; tabular or irregular shapes	Au, Sn, Mo, W, Cu, Pb, Zn, As

Classification of Ore Deposits

Tectonic classification of ore deposits

I. Deposits at oceanic ridges (divergent plate margins)
Volcanogenic massive sulfide deposits (Cu, Zn)
Sedimentary exhalative deposits (Zn, Cu, Pb, Au and Ag). e.g. Red Sea
Mn nodules (Mn, Ni, Cu, Co …)
Cr, PGE, asbestos in ultramafic rocks
II. Deposits at convergent plate margins
Porphyry Cu-Mo deposits
Other base metal deposits (Cu, Pb, Zn, Mo)
Precious metals (Pt, Au, Ag)
Pb–Zn–Ag veins and contact metasomatic deposits
Other metals (Sn, W, Sb, Hg)
III. Deposits in cratonic rift systems
Deposits of Sn, fluorite, barite in granites
Evaporites in rift basins
Carbonatites containing Nb, P, REE, U, Th and other rare elements
IV. Deposits in intracontinental settings
Ni and PGE in layered intrusions
Ti in anorthosites
Iron-oxide Cu-Au deposits
Pb–Zn–Ag deposits in limestones and clastic sediments
Sedimentary Cu deposits
Ni, Al laterites
Diamonds in kimberlites

Genetic classification of ore-forming processes

ENDOGENOUS GROUP

Category Magmatic

Class Liquation

Class Crystallization

Subclass Early crystallization

Subclass Late crystallization

Category Fluid-magmatic

Class Plutonogenous

Ore formation Rare-metal-ornamental granite pegmatite

Ore subformation Rare-metal

Ore subformation Ornamental stones

Class Ultra-metamorphogenous

Category Hydrothermal

Class Magmatogenous

Subclass Plutonogenous

Ore formation *Ferrum-phosphous- rare metal* ***carbonates***

Ore subformation Ferrum-phorsphous

Ore subformation *Rare-metal- rare earth*

Ore subformation *Polymetallic*

Ore formation *Gold-uranium-polymetallic* ***beresite***

Ore subformation *Gold*

Geological type

Ore subformation *Uranium*

Geological type

Ore subformation *Antimonite*

Geological type

Ore subformation *Polymetallic*

Subclass **Volcanogenous**

Class Metamorphogenous

Subclass Greenschist

Subclass Epidote-amphibolite (amphibolite)

Subclass Granulite

EXOGENOUS GROUP

Category Hydragenous

Class Residual

Subclass Siallites

Subclass Laterites

Class Infiltrated

Category Sedimentary

Class Mechanical substance sedimentation

Subclass Continental

Subclass Marine

Class Chemical substance sedimentation

Subclass Continental

Subclass Marine

Ore formation *Ferrum-manganese-carbonate-sandy-argillaceous*

Ore subformation *Iron ore*

Ore subformation *Manganese*

Class Biochemical substance sedimentation

Subclass Continental

Subclass Marine

POLYGENOUS GROUP

Category Hydrothermal-sedimentary (kuroko type)

Category Metamorphised

Category Unconformity type