

Non Ferrous Extractive Metallurgy

Credits:4

Unit 1:

COPPER; Principle Ores and Minerals; Matte smelting – Blast furnace, Reverberatory, Electric furnace, Flash; Converting; Continuous production of blister Copper; Fire refining; Electrolytic refining; Hydro-Metallurgical copper extraction; Leaching processes, Recovery of copper from leach solutions; Electro-winning.

Unit 2:

ZINC; General Principles; Roasting, Horizontal and vertical retort processes; Production by imperial smelting; Leaching purification; Electrolysis, Refining.**LEAD;** Smelting – smelting, Reduction process, Roast Reaction process, direct smelting reduction process – Air flash smelting, oxygen flash, oxygen slip bath smelting, QSL process, refining of lead bullion. Pyro and electrolytic refining.

Unit 3:

ALUMINIUM; Raw materials, production of pure Al_2O_3 , Bayer's process, Devillepechiney Process, Hall - Heroult cell, electrolyte, electrode reactions, Current efficiency, Cell Voltage, Anode effect; Refining of Aluminum, Alternative processes of aluminium production.

Unit 4:

MAGNESIUM; Production of a hydrous Magnesium chloride from sea water and magnesite. Electro-winning practice and problem, refining, Pidgeon and Hansgrig processes.

Unit 5:

TITANIUM; Upgrading of ilmenite, chlorination of titania, Kroll's process. Refining. **SODIUM;** Down's cell process and Castner's Process

Unit 6:

URANIUM; Acid and alkali processes for digestion of uranium ores, Purification of crude salt, Production of reactor grade UO_2 and uranium. Simplified flow sheets for the extraction of nickel, tungsten, silver and gold. Review of non-ferrous metal industries in India.

TEXT BOOKS;

1. Extraction of Non-Ferrous Metals - HS Ray, KP Abraham and R. Sridhar
2. Non Ferrous Extractive Metallurgy – G B Gill John Wiley & Sons 1980

REFERENCES;

1. Hand Book of Extractive Metallurgy Vol. 2 & 3, Fathi Habashi Wiley – PCH 1997
2. Extractive Metallurgy of Copper - WGL Davlin Port, U King, M Schelesinger and A.K. Biswas, Elsevier Science 2002
3. Metallurgy of Non-Ferrous Metals - WH Dennis.
4. Nuclear Chemical Engineering - Manstion Benedict and Thomas H. Pigfort