

Occurrence of Metals:

Element which have low chemical reactivity generally occur native or free or metallic state. e.g.

Au, Pt,

noble gas etc. Element which are chemically reactive, generally occur in the combined state. e.g. halogens, chalcogens etc. The natural materials in which the metals occur in the earth are called minerals. The mineral from which the metal is conveniently and economically extracted is called an ore. All the ores are minerals but all minerals cannot be ores. Ores may be divided into four groups,

(1) Metallic core (siderophile) of the earth crust contains (Mn, Fe, Co, Ni, Cu, Ru, Rb, Pd, Ag, Re, Os, Ir, Pt, Au). Entire composition of metals in earth crust may be given as,

Al (8.3%); Ca(3.6%); Na (2.8%); K (2.6%); Mg (2.1%); Ti (0.4%); Mn (0.1%); Fe (5.1%) other metals (0.1%).

(i) Native ores : These ores contain metals in free state, e.g., silver, gold, platinum, mercury, copper, etc. These are found usually associated with rock or alluvial materials like clay, sand, etc. sometimes lumps of pure metals are also found. These are termed nuggets. Iron is found in free state as meteorites which also have 20 to 30% nickel.

(ii) Sulphurised and arsenical ores : These ores consist of sulphides and arsenides in simple and complex forms of metals. Important ores of this group are

Metal	Name of the ore	Composition
Pb	Galena	PbS
Zn	Zinc blende	ZnS
Hg	Cinnabar	HgS
Ag	Argentite or silver glance Pyrargyrite or ruby silver	Ag_2S $3Ag_2S.Sb_2S_3$
Fe	Iron pyrites	FeS_2
Ni	Kupfer nickel	NiAs
Cu	Copper pyrites Chalcocite or Copper glance	$CuFeS_2$ Cu_2S

(iii) Oxidised ores : In these ores, metals are present as their oxides or oxysalts such as carbonates, nitrates, sulphates, phosphates, silicates, etc.

Important ores of this group are listed below,

Oxides

Haematite	Fe_2O_3	}
Magnetite	Fe_3O_4	
Limonite	$Fe_2O_3.3H_2O$	
Bauxite	$Al_2O_3.2H_2O$	}
Corundum	Al_2O_3	
Diaspore	$Al_2O_3.H_2O$	
Chromite	$FeO.Cr_2O_3$	}
Chromeoche	Cr_2O_3	
Tinstone (Cassiterite)	SnO_2	
Chrysoberyl	$BeO.Al_2O_3$	
Cuprite (Ruby copper)	Cu_2O	

Pyrolusite	MnO_2	
Zincite	ZnO	
Rutile	TiO_2	}
Ilmenite	$FeO.TiO_2$	

Carbonates

Magnesite	$MgCO_3$	
Lime stone	$CaCO_3$	
Dolomite	$CaCO_3.MgCO_3$	
Calamine	$ZnCO_3$	
Malachite	$CuCO_3.Cu(OH)_2$	}
Azurite	$Cu(OH)_2.2CuCO_3$	
Cerussite	$PbCO_3$	
Siderite	$FeCO_3$	

Nitrates

Chile saltpetre	$NaNO_3$
Salt petre	KNO_3

Sulphates

Epsom salt	$MgSO_4.7H_2O$	
Barytes	$BaSO_4$	
Gypsum	$CaSO_4.2H_2O$	
Glauber's salt	$Na_2SO_4.10H_2O$	
Anglesite	$PbSO_4$	
Kainite	$KCl.MgSO_4.3H_2O$	}

Schonite	$K_2SO_4.MgSO_4.6H_2O$
Polyhalite	$K_2SO_4.MgSO_4.CaSO_4.2H_2O$

Phosphates and Silicates

Lepidolite (an ore of lithium)	$(Li, Na, K)_2 Al_2(SiO_3)_3 (F, OH)_2$	}
Petalite (an ore of lithium)	$LiAl(Si_2O_5)_2$	
Triphylite (an ore of lithium)	$(Li, Na)_3 PO_4, (Fe, Mn)_3 (PO_4)_2$	
Beryl (an ore of beryllium)	$3BeO. Al_2O_3.6SiO_2$	
Willemite	Zn_2SiO_4	
China clay	$Al_2O_3.2SiO_2.2H_2O$	
Chlor-apatite	$3Ca_3(PO_4)_2.CaCl_2$	
Mica	$K_2O.3Al_2O_3.6SiO_2.2H_2O$	
Fluor-apatite	$3Ca_3(PO_4)_2.CaF_2$	
Felspar	$KAlSi_3O_8$	
Talc	$Mg_3(Si_2O_5)_2.Mg(OH)_2$	
Asbestos	$CaMg_3.(SiO_3)_4$	

(iv) Halide ores : Metallic halides are very few in nature. Chlorides are most common. For example.

Common salt $NaCl$; Horn silver $AgCl$; Carnallite $KCl.MgCl_2.6H_2O$;

The important fluoride ores are Fluorspar CaF_2 ; Cryolite Na_3AlF_6

