

Metal	Mineral ores	Family	Properties	Uses	Processes
Iron Fe	High grade mineral ore: 1-Magnetite 2-Hematite Low grade mineral ore: Taconite	Fe _x O _y →oxides	1-Highly corrosive 2-Conducts heat 3-Conducts electricity	Production of steel: 1-iron + nickel (metal) 2-iron + molybdenum (metal) iron + carbon (non-metal) steel is tougher, less brittle and more resistant to wear than iron	<u>Igneous deposits:</u> 1- Vanadium used <i>in armor plates</i> not for iron.(no mineral ore, it is a by-product of magnetite) 2-contact metamorphism: skarn deposits 3-Sea-floor volcanism: metal sulfide deposits (marine processes) <u>Residual Deposits:</u> Laterites: red rich iron oxides that deposit due to weathering:are considered as future resources of iron but may cause massive environmental problems. Banded Iron Formations BIF Largest concentrations of iron oxide deposits and world's major source of iron
	Fayalite (Fe ₂ SiO ₄)				
	Pyrite (FeS ₂)				
Manganese	pyrolusite (MnO ₂)	Oxide	Manganese is brittle	1-Production of iron steel,where 90% is consumed. 2-Used in iron smelting to remove impurities(7Kg used for each ton). Used in chemical industry: 1-use of potassium permanganate for the treatment of water. 2-use of manganese dioxide in cell batteries industry	Found in ferro-manganese nodule (black spread on the ocean floor depth of 4000cm.(mixture of iron, manganese oxides or hydroxides)

Aluminum	Bauxite. $\text{Al}(\text{OH})_3$ Most important	Hydroxide	1-light in weight 2-malleable 3-ductile 4-excellent conductor of electricity 5-valued gemstones as ruby and sapphires are recognized as oxides of this metal. 6-high melting point.	1-transportation 2-packing 3-containers 4-building products 5-refrigerating 6-cans manufacturing 7-used as absorbents in oil and gas refinery. 8-refractory for steel.	Frequently in subtropical zone, During chemical weathering , and where there exist aluminous parent rocks, soluble ions like Na, K, Mg and Ca are removed in solution leaving a residue rich in hydroxides, <i>clay</i> and <i>kaolinite</i> (AlSi-hydroxide). percolating water tend at a later stage to dissolve the clays and remove the silica. The resulting rock is an aluminum rich <i>laterite</i> (or highly leached soil) called bauxite. Other forms of bauxite develop as a terra rosa type.
Titanium	Rutile (TiO_2) ilmenite (FeTiO_3) impure	oxide	1-high strength to weight ratio 2-high melting point 3-great resistance to corrosion 4-resistant to weathering	Its alloy with Al: 1-aircraft industry (engines and frames) 2-electricity generating plants. 3-paint industry 4-rubber industry	Weathered igneous and metamorphic rocks and eroded products lead to the formation of placer deposits that contain ilmenite (48% to 65%) and rutile (93-96%).
Magnesium	magnesia (MgO)	oxide	<i>The eighth most abundant element</i> (1.87) 1-the lightest one.	Refractories and metal industries 1-alloy of magnesium and aluminum to produce lightweight metal used in beverage cans, automobiles and machinery. 2-used for fertilizers 3-rubber and cement manufacturing	Evaporites: (saline water) Extracted from Brines of deep wells and from seawater. Brine: water with high concentration of salt and minerals trapped between evaporites.
	forsterite (Mg_2SiO_4)	silicate			
Silicon	Silanes SiH_4 Quartz Quartzite rock pegmatite	silicate	Pure silicon is: 1-light-weighted silvery substance 2-has a lustrous (shiny) appearance 3-very brittle.	1-ferroalloys (iron and silicon) used in steel industry. 2-silicon chips used in computers or photo/solar cells 3-alloy: Silanes (Si+H) are used in manufacturing rubber, adhesives and lubricants	

