Metals-Olevel Cheat Sheet

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Properties of Metals

Metals have very high densities - A large number of metal atoms are closely packed in the giant metallic lattice

Metals are good conductors of heat and electricity - presence of sea of delocalised electrons(help to conduct heat and electr-icity)

Metals are soft - When a force is applied, layer of metal atoms will slide over one another

Metals are malleable and ductile - When a force is applied, layer of metals slides over one another without disrupting metallic bonds

Metals have a high melting point - Large amount of energy is required to overcome the strong metallic bonds between lattice of positive cations and sea of delocalised electrons

Remember: Metallic bonding in metals

Alloys

What is an alloy - mixture of a metal with one or more other elements

Effect of alloying - makes the original metal stronger, harder and more resistive to corrosion

How does alloying strengthen metals - Neat, regular rows of metal atoms are disrupted by the presence of a new atom of a different size. Layers of metal atoms can no longer slide over one another when a force is applied. Hence the metal is stronger and harder

Common alloys - Steel/ Brass

Reactivity Series

Reactivity Series (cont)

Au

Trend of reactivity series: Reactivity decreases down the series

Reactions that establish the reactivity series

Metal + Water = Metal hydroxide + Hydrogen

Metal + Steam = Metal oxide +Hydrogen

Metal + HCL = Metal Chloride + Hydrogen gas

Metals that react with cold water - Potassium to Magnesium (decreasing vigour)

Metals that react with steam: Potassium to Iron

Metals that react with hydrochloric acid: Potassium to Iron

Why does lead not react with water/ste-am/HCl = Formation of lead hydroxide, lead oxide, lead chloride which are all insoluble (form layer)

Reactions based on reactivity series

Displacement - A more reactive metal displaces a less reactive metal from its salt solution/ oxide (more reactive metal in solid state/less reactive metal in ion state)

Thermal Stability of carbonates - Thermal stability of carbonates decreases down the reactivity series

Most thermally stable carbonates - Group 1 carbonates

Thermal decomposition of carbonates= metal oxide + carbon dioxide

Thermal decomposition of silver carbonate= silver + carbon dioxide + oxygen

Extraction of metals

Rusting

Rusting - oxidation of iron to form hydrated iron(III) oxide

Conditions for rusting - Both oxygen and water

Prevention of rusting: Protective layer(-oil/paint), Sacrificial Metals, Use of alloys

Protective layer (must cover entire surface): prevents iron from coming in contact with oxygen and water—prevents rusting

Sacrificial Protection(no need to cover entire surface): Metal A is more reactive than Metal B. Metal A acts as a sacrificial metal and corrodes in the place of iron

Example of sacrificial protection- Galvanisi-ng(Zinc)

Use of alloys - alloys are more resistive to corrosion

Do not use sodium and potassium as sacrif-icial metals (too reactive)
Use zinc/magnesium

Recycling of metals

Why must we recycle metals - Metals are finite resources. It is our responsibility to conserve metals for future purposes

Problems with mining: contribute to enviro-nmental pollution, burning of fossil fuel, contributes to unnecessary waste(take up landfill space)

Cons of recycling: Expensive process

Why is aluminium unreactive?

Reacts with oxygen in surrounding air to form aluminium oxide. Aluminium oxide forms an impervious layer on the surface of the metal

Prevents metal form coming into contact with the other reactant

Prevents metal form coming into contact with the other reactant

Hence aluminium is unreactive

K
Na
Ca
Mg
Al
C
Zn
Fe
Sn
Pb
H
Cu
Ag

Electrolysis of molten ore - Potassium to Aluminium
Reduction of carbon : Below Carbon in reactivity series
Reduction of hydrogen : Iron - Copper
Found chemically uncombined: Silver and Gold
Extraction of iron - Use carbon to reduce haematite to form molten iron (blast furnace)

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Published 4th May, 2023.
Last updated 4th May, 2023.