CONCEPT MAP

THE s-BLOCK ELEMENTS

Alkali and alkaline earth metals represent the s-block of the periodic table and their compounds find wide applications in various industries, medicines and in our daily life.

ALKALI METALS

Atomic and Physical Properties

- Belong to group 1 of the periodic table.
- General electronic configuration : [Noble gas] ns^1
- The atomic and ionic radii increase while going from Li to Cs.
- Ionisation enthalpy decreases down the group.
- Hydration enthalpies of M^+ ions decrease down the group.
- Density increases down the group.
- Flame colouration : Li-Crimson red, Na-Yellow, K-Violet, Rb-Red violet, Cs-Blue
- Low melting and boiling points.
- Form ionic compounds.

Chemical Properties

- All tarnish in air, Li forms oxide (Li_2O), Na forms peroxide (Na_2O_2) and others form superoxides (MO_2), where M = K, Rb, Cs.
- Lithium shows exceptional behaviour forming nitride Li_3N.
- All form MX type halides with halogens.
- All react with water to form hydroxides and H_2.
- All form hydrides with H_2.
- They are good reductant, Li is most while Na is least powerful.
- Dissolve in liquid NH_3 giving highly conducting deep blue solutions.
- They form salts of oxoacids, like carbonates, sulphates and nitrates.
- Li shows anomalous behaviour due to its small size, high polarising power and absence of d-orbitals.

Important Compounds of Sodium

$Na_2CO_3 . 10H_2O$ (Washing soda)
- Prepared by Solvay process.
- Used in water softening, laundering and cleaning.

NaCl (Common salt)
- Obtained from sea water.
- Used in the preparation of Na_2O_2, NaOH and Na_2CO_3.

$NaHCO_3$ (Baking soda)
- Prepared by saturating a solution of Na_2CO_3 with CO_2.
- Used in fire extinguishers and as an antiseptic.

NaOH (Caustic soda)
- Prepared by electrolysis of NaCl in Castner–Kellner cell.
- Used in preparation of soap, paper, artificial silk and in petroleum refining.

ALKALINE EARTH METALS

Atomic and Physical Properties

- Belong to group 2 of the periodic table.
- General electronic configuration : [Noble gas] ns^2
- The atomic and ionic radii of alkaline earth metals are smaller than those of the corresponding alkali metals and increase while going from Be to Ra.
- Ionisation enthalpy decreases down the group.
- Hydration enthalpies of alkaline earth metal ions are larger than those of alkali metal ions and decrease down the group.
- Density increases from Be to Ca and increases from Ca to Ra.
- Flame colouration : Ca-Brick red, Sr-Crimson, Ba-Apple green, Ra-Crimson
- Higher melting and boiling points than the corresponding alkali metals due to smaller size.
- Form ionic compounds (except Be).

Chemical Properties

- All form monoxides, MO with oxygen and react with water to form hydroxides except Be.
- All form nitrides, M_3N_2.
- All form MX_2 type halides with halogens.
- All form hydrides with H_2 except Be.
- They are good reductant though weaker than the alkali metals and reducing power increases down the group.
- Dissolve in liquid NH_3 to give deep blue-black solutions.
- They form salts of oxoacids, like carbonates, sulphates and nitrates.
- Be shows anomalous behaviour due to small size, high ionisation enthalpy and absence of d-orbitals.

Important Compounds of Calcium

$CaSO_4 \cdot 1/2\ H_2O$ (Plaster of Paris)
- Prepared by heating gypsum at 393 K.
- Used in making casts of statues and busts, etc.

CaO (Quick lime)
- Prepared by heating limestone.
- Used in manufacturing cement and dye stuffs.

$CaCO_3$ (Calcium carbonate)
- Prepared by passing CO_2 through slaked lime or by addition of Na_2CO_3 to $CaCl_2$.
- Used in manufacturing of CaO, high quality paper, etc. and as an antacid, mild abrasive in toothpaste.

$Ca(OH)_2$ (Slaked lime)
- Prepared by adding water to quick lime.
- Used in the preparation of mortar and in whitewash.

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