CHAPTER

# 10 The s-Block Elements

## General properties of alkali metals

- General electronic configuration is [Noble gas]$ns^1$; n = 2 to 7

$$\xrightarrow{Li^+\ \ Na^+\ \ K^+\ \ Rb^+\ \ Cs^+}$$

- On moving down the group:
  - Degree of hydration decreases.
  - Hydration energy decreases.
  - Hydrated ion size decreases.
  - Ionic conductance increases.
- On dissolving Metal in $NH_3$
  - $M(s) \xrightarrow[NH_3]{} M^+ + e^-$
  - $M^+ + x(NH_3) \rightarrow [M(NH_3x)]^+$ Ammoniated cation
  - $e^- + y(NH_3) \rightarrow [e(NH_3)_y]^-$ Ammoniated electron
  - The blue colour is due to → Ammoniated electron
  - The paramagnetic nature is due to → Ammoniated electron
  - The conducting nature is due to $M^+$ + Ammoniated electron → Ammoniated electron

## General properties of alkaline earth metals

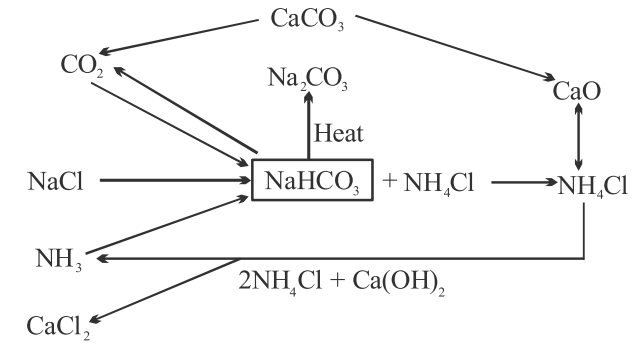
- General electronic configuration is [Noble gas]$ns^2$; n = 2 to 7

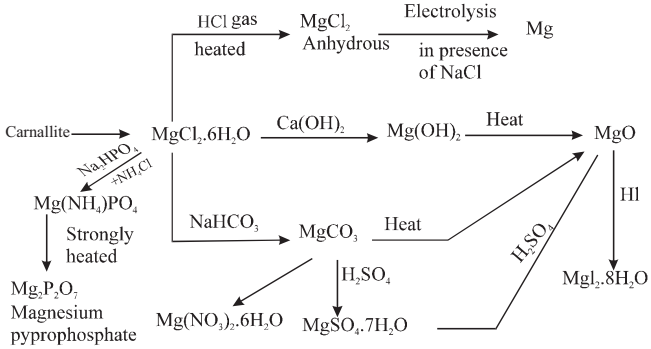
$$\xrightarrow{Be^{2+}\ \ Mg^{2+}\ \ Ca^{2+}\ \ Sr^{2+}\ \ Ba^{2+}}$$

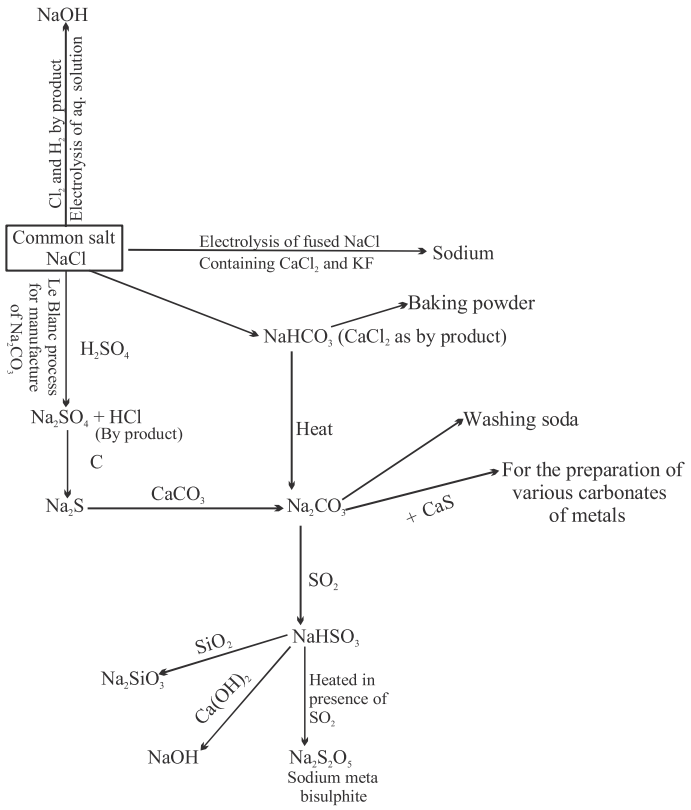
- On moving down the group:
  - Atomic radii increases.
  - Degree of hydration decreases.
  - Hydration energy decreases.
  - Hydrated ion size decreases.
  - Ionic conductance increases.

## Important compounds of s-block elements

**Flow Sheet of Solvay Process**






**Chlorides of Alkaline Earth Metal**

- $BeCl_2$ in the vapour phase above 900ºC is monomeric, below 900ºC exists as dimer and in the solid state exists as a polymeric chain structure. When dissolved in a coordinating solvent it exits as a monomer.
- Anhydrous $MgCl_2$ cannot be prepared by simple heating of hydrated magnesium chloride, $MgCl_2 6H_2O$ as it gets hydrolysed to magnesium oxide.

$$MgCl_2.6H_2O \xrightarrow{\text{Heat}} MgO + 2HCl + 2H_2O$$

- Out of the oxides of group 2 elements only BeO is extremely hard, non volatile, has high melting point and is amphoteric.

**Oxide of Calcium**

Quick lime (CaO) is obtained when limestone is heated at about 1000ºC. On adding water, quick lime gives a hissing sound and forms calcium hydroxide, known as slaked lime. The paste of lime in water is called milk of lime while the filtered and clear solution is known as lime water. Chemically, both are $Ca(OH)_2$.

Quick lime is used for making caustic soda, bleaching powder, calcium carbide, mortar, cement, glass, dye stuffs and purification of sugar.

***Mortar*:** It is a building material. It consists of slaked lime and silica in the ratio of 1:3. The mixture makes a paste with water. It is called mortar.

## Analytical Detection of Mg

(i) Charcoal cavity test: On heating charcoal cavity with one drop of $Co(NO_3)_2$, a pink colour is imparted to the residue, CoO.MgO.

(ii) The salt solution when mixed with $NH_4Cl$ and $NH_4OH$ and finally treated with soluble phosphates forms a white precipitate of magnesium ammonium phosphate.

$$MgSO_4 + Na_2HPO_4 + NH_4OH \rightarrow \underset{\text{White ppt.}}{Mg(NH_4)PO_4} + Na_2SO_4 + H_2O$$