

## Group 2 elements: Alkaline earth metals

(a) Atomic radii : The atomic radii of alkaline earth metals are fairly large though

smaller than the corresponding alkali metals and they increase down the group. This

is because on moving down the group, atomic radii increase primarily due to the

addition of an extra shell of electrons in each succeeding element.

(b) Ionic radii: the atoms of these elements form divalent ions which show the same

trend of increase in their size down the group.

(c) Ionization enthalpy: The alkaline earth metals have fairly low ionization enthalpies though greater than those of the corresponding elements of group 1 and

this value decreases down the group.

(d) Hydration enthalpy: the hydration enthalpies of alkaline earth metal ions decrease as the size of the metal ion increases down the group

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

(e) Oxidation State: All the members of the family exhibit +2 oxidation state in their

compounds and they form divalent cations ( $\text{M}^{2+}$ )

(f) Electro negativity : The electro negativity values of alkaline earth metals are

quite close to those of alkali metals, though slightly more.

(g) Metallic Character : Alkaline earth metals have stronger metallic bonds as compared to the alkali metals present in the same period.

(h) Melting and boiling point : The melting and Boiling points of these metals are

higher than those of alkali metals present in the same period.

(i) Colouration to the flame : With the exceptio9n of beryllium and magnesium, the

rest of the elements impart characters in colour to the same flame.

J) Complex formation: Generally the members do not form complexes. However,

smaller ions ( Be & Mg Ions) form complexes with the electron donor species

k) Formation of organo-metallic compounds: Both beryllium and magnesium form a number of organo-metallic compounds containing M-C bond with certain

organic compounds. For example, magnesium reacts with alkyl halide in the presence of dry ether to give Grignard reagent.

l) Reducing character: Alkaline earth metals are weak reducing agent than the

corresponding alkali metals which have lower ionization enthalpies and comparatively bigger atomic sizes.

m) Reaction with oxygen: With the exception of Ba and Ra which form peroxides ( $\text{MO}_2$ ) rest of the metals form normal oxides ( $\text{MO}$ ) on heating with excess of oxygen.

n) Reaction with halogens: The members of the family combine directly with halogen at appropriate temperature to form corresponding halides.

o) Reaction with water: The members of this group are less reactive towards water

as compared to the corresponding alkali metals because these are less electropositive in nature.

p) Reaction with hydrogen: The members except Be combine with hydrogen directly upon heating to form metal hydrides.

Uses of some important compounds:-

(i) Caustic soda:

It is used: in soap, paper, textile, petroleum industry

ii) Sodium carbonate

It is used:

a) in glass and soap industry

b) in paper making and textile manufacturing

c) in paint and dye stuffs

d) in metal refining

125

e) in production of sodium compounds such as borax, caustic soda, sodium phosphate etc.

iii) Quick lime:

It is used:

a. in the preparation of cement, glass and calcium carbide.

b. In the purification of sugar

c. In softening of hard water d. As a flux in the extraction of metal

iv) Lime stone: It is used

a) as building material

b) in the manufacture of quick lime

c) in Solvay process to prepare  $\text{Na}_2\text{CO}_3$  as it is a source of  $\text{CO}_2$

d) in metallurgy for the extraction of iron

e) in toothpaste and certain cosmetics

v) Cement: It is an important building material. It is used in concrete and reinforced

concrete, in plastering and in the construction of bridges, dams and buildings.

vi) Plaster of paris: It is used

a) in making moulds for pottery and ceramics etc.

b) in surgical bandages for setting broken bones of the body

c) for making statues, models, decorative materials and black board chalk.

☒ Biological importance of Ca and Mg

i) Magnesium ions are concentrated in animal cells and Calcium ions are concentrated in body fluids, outside the cell.

- ii) All enzymes that utilize ATP in phosphate transfer require magnesium ion as cofactor.
- iii) In green plants magnesium is present in chlorophyll.
- iv) Calcium and magnesium ions are also essential for the transmission of impulses along nerve fibres.
- v) Calcium ions are important in blood clotting and are required to trigger the contraction of muscles.
- vi) Calcium ions also regulate the beating of the heart.