ANOMALOUS PROPERTIES OF BERYLLIUM

Anomalous Behavior of Beryllium

The characteristics of beryllium, the initial member of the alkaline earth metals, distinguish it from the remaining members. These distinctions primarily arise from:

(i) Its small size and strong polarizing capability.

(ii) Comparatively higher electronegativity and ionization energy when compared to other members.

(iii) The lack of available d-orbitals within its valence shell.

Here are a few key distinctions between beryllium and other members, particularly magnesium: [Please provide the specific points of difference for a more precise rephrasing.]

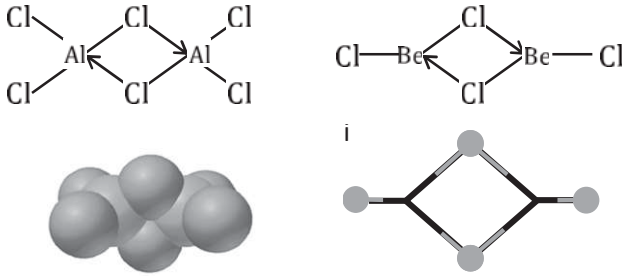
S.No.	Properties	
1.	Hardness	Be is harder than other members of its group
2.	Density	Be is lighter than Mg
3.	M.P. and B.P.	Higher than other members of its group.
4.	Reaction with water	Be does not react with water while Mg reacts with boiling water.
5.	Nature of oxides	BeO is amphoteric while MgO is weakly basic.
6.	Nature of compounds	Be forms covalent compounds whereas other members form ionic compounds.
7.	Carbide	Beryllium carbide reacts with water to give methane whereas carbides of other alkaline earth metals give acetylene gas. $Be_2C + 4H_2O \rightarrow 2Be(OH)_2 + CH_4$ $MgC_2 + 2H_2O \rightarrow Mg(OH)_2 + C_2H_2$ $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$
8.	Hydride	The beryllium hydride is electron deficient and polymeric, with muti center bonding like Alu minimum hydride.
9.	Co-ordination number	Beryllium does not exhibit coordination number more than four as it has four orbitals in the valence shell. The other members of this group have coordination number 6.
10.	Reaction with Alkali	Be dissolves in alkalis with evolution of hydrogen $Be + 2NaOH + 2H_2O \rightarrow Na_2BeO_2.2H_2O + H_2$ (Sodium beryllate) Other alkaline earth metals don't react with alkalis.

Resemblance of Beryllium with Aluminums (Diagonal relationship)

Diagonal Relationship Between Beryllium and Aluminum

The following points illustrate the anomalous behaviour of Be and its resemblance with Al.

S.No.	Properties	Be and Al
1.	Nature of compounds	Unlike groups-2 elements but like aluminum, beryllium forms covalent compounds.
2.	Nature of hydroxide	The hydroxides of Be, [$Be(OH)_2$] and aluminum [$Al(OH)_3$] are amphoteric in nature, whereas those of other elements of group – 2 are basic in nature.

3.	Nature of oxide	The oxides of both Be and Al i.e. BeO and Al_2O_3 are high melting insoluble solids.
4.	Polymeric structure	$BeCl_2$ and $AlCl_3$ have bridged chloride polymeric structure. 
5.	Salts	The salts of beryllium as well as aluminum are extensively hydrolyzed.
6.	Carbides	Carbides of both the metal reacts with water liberating methane gas. $Be_2C + 4H_2O \rightarrow 2Be(OH)_2 + CH_4$ $Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$
7.	Oxides and hydroxides	The oxides and hydroxides of both Be and Al are amphoteric and dissolve in sodium hydroxide as well as in hydrochloric acid. $BeO + 2HCl \rightarrow BeCl_2 + H_2O$ $BeO + 2NaOH \rightarrow Na_2BeO_2 + H_2O$ $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + H_2O$ $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$
8.	Reaction with acids	Like Al, Be is not readily attacked by acids because of the presence of an oxide film.