Group 2

General Information

Electronic configurations: Mg (Ne) 3s²

Ca (Ar) 4s² Sr (Kr) 5s² Ba (Xe) 6s²

Group 2 atoms all have 2 electrons in their outer s subshell which are lost when they form +2 ions.

Atomic radii increase down the group due to increasing number of electron shells.

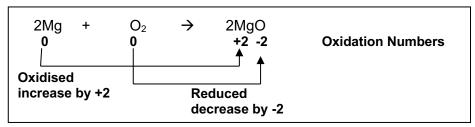
lonisation energies decrease down the group and so they become more reactive down the group. So it becomes easier to form a 2+ ion. (See ionisation energy notes.)

Redox Reactions of Group 2 Metals

During reactions each atom loses two outer s electrons, forming a 2+ ion, so the metals are reducing agents. They are oxidised.

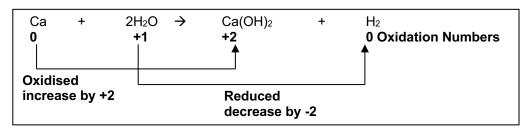
With oxygen

All burn vigorously in air, forming white solid oxides. eg



With water

Group 2 metals reduce water to hydrogen, producing an alkaline solution. A white precipitate of the sparingly soluble metal hydroxide is also formed.



With dilute acids

Barium + hydrochloric acid → Barium chloride + Hydrogen

Ba + 2HCl → BaCl₂ + H₂

Reactivity increases down the group due to decreasing ionisation energy. (Greater atomic radius, outer electrons further from nucleus, greater shielding.) Mg reacts very slowly with cold water. The first and second ionization energies decrease down the group.

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Reactions of Group 2 Compounds

• Group 2 oxides with water

Group 2 oxides react exothermically with water to from the metal hydroxide, producing an alkaline solution, pH 9-14

 $CaO + H_2O \rightarrow Ca(OH)_2$

Alkalinity increases down the group as the hydroxides become more soluble.

Physical properties of group 2 elements and their compounds

Elements are metals so good thermal and electrical conductors. They are harder and denser than group 1 metals. **Compounds** are white with high melting points because they are ionic.

Uses of group 2 elements and their compounds

Calcium hydroxide (an alkali) is used as a solid in agriculture to neutralise acid soils. Magnesium hydroxide (a weak alkali) and calcium carbonate are used in indigestion tablets as an antacid.

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