

Group 2

Group 2 elements: Redox reactions:

The Group 2 elements:

- These are also called the alkaline earth metals as their hydroxides are alkaline.
- Remember that the reactivity increases as you move down Group 2 (see ionisation energies)

Physical properties:

- All light metals.
- Compounds are white or colourless.
- They have reasonably high melting and boiling points.

Electronic configuration:

- All in the s block sub - shell and all have s^2 electrons.

Reactivity of Group 2 elements:

- Group 2 metals are reactive:



- These elements give away 2 electrons when they react.
- This means that what ever they react with must gain electrons.
- Gaining electrons is a reduction reaction:

Oxidation

Is

Loss of electrons

Reduction

Is

Gain of electrons

- As the Group 2 elements cause the reduction of other compounds or elements we say it is a good **Reducing agent**.
- Reactivity increases as you go down the Group. This means they lose their electrons more readily.
- This means as you go down Group 2, they become better **Reducing agents**

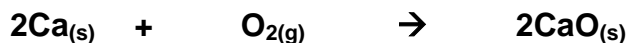
Reaction with oxygen

- Group 2 metals react vigorously with oxygen to give the oxide:

Metal + Oxygen → Metal oxide

- The reaction gives an ionic product. If you apply oxidation numbers, you can see what has been oxidised and reduced:

Calcium + Oxygen → Calcium oxide



Element	2Ca _(s)	+	O _{2(g)}	→	2CaO _(s)	Change in Ox No		Redox
						Up	Down	
Ca	0				+2	2		Ox
O			0		-2		2	Red

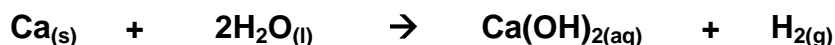
Reaction with water

- Group 2 metals react with water to give the hydroxide and hydrogen gas:

Metal + Water → Metal hydroxide + Hydrogen

- The reaction gives an ionic product. If you apply oxidation numbers, you can see what has been oxidised and reduced:

Calcium + Water → Calcium hydroxide + Hydrogen



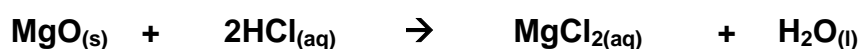
Element	Ca _(s)	+	2H ₂ O _(l)	→	Ca(OH) _{2(aq)}	+	H _{2(g)}	Change in Ox No		Redox
								Up	Down	
Ca	0				+2			2		Ox
H			+1		(+1)		0		1	Red
O			-2		-2		-	-	-	

- Note that only one of the H from each water molecule has been reduced

Group 2 compounds: reactions

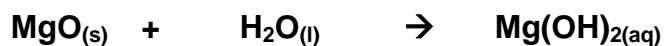
Group 2 oxides and hydroxides:

- These are bases as they neutralise acids to form salts and water:



1) Group 2 oxides:

- These react with water to form metal hydroxide.



- These are soluble so dissolve in the water forming an alkali, pH10 - 12

2) Group 2 hydroxides:

- As these are soluble, they dissolve in water forming alkaline solutions::



Solubility
increases

Alkalinity
increases

- The **solubility** of the Group 2 hydroxides **increases** as you go **down the Group**.
- This means that as you go **down Group 2 more hydroxide ions** are formed (for the same amounts).
- This means that as you go **down Group 2 they become more alkaline**.

3) Group 2 carbonates:

- The Group 2 carbonates **decompose** when **heated, Thermal Decomposition:**

Is the breaking down of a chemical substance with heat into at least 2 chemical substances



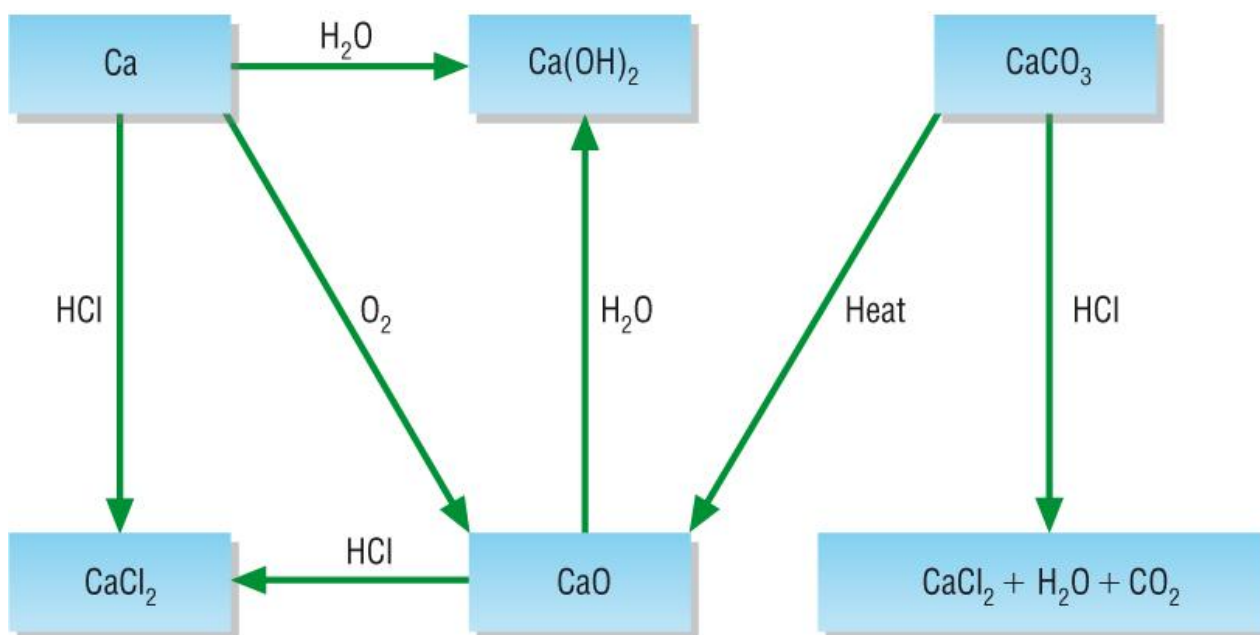
Ease of
thermal
decomposition
decreases

- **As you go down Group 2, the carbonates become harder to decompose.**

Properties of Group 2 elements and their compounds:

- Because of Periodicity we only have to learn the Chemistry for one of the elements in Group 2.
- **All the elements in Group 2 will react in the same way (but with different vigour).**
- As you go **down Group 2**: the elements become **more reactive**.
- As you go **down Group 2**: the carbonates **decompose at higher temperatures**.
- As you go **down Group 2**: the **hydroxides** become **more soluble** in water, making the solution **more alkaline**.

Reactions of calcium and its compounds (or any Group 2 element / compound)



Uses of Group 2 hydroxides:

1) Calcium hydroxide

- Is used to reduce the acidity of soil:



2) Magnesium hydroxide

- Is used in indigestion tablets / 'milk of magnesia' to neutralise excess stomach acid.

