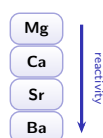


Group 2

A-Level Chemistry • Topic 10

A-Level Chemistry



Group 2

What we will cover

- 1 Reactivity down the group
- 2 Reactions of the elements
- 3 Thermal decomposition
- 4 Solubility trends



magnesium burns brilliantly

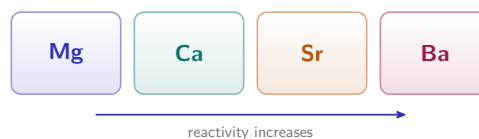
1 The metals

Group 2

↳ The metals

Reactivity down the group

Group 2 metals get **more reactive** down the group: the outer pair is further from the nucleus and more shielded, so it is lost more easily.



Group 2

↳ The metals

Reactions of the elements

with oxygen: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

with water: $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

with acid: $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$

Reactions get faster down the group – but with **sulfuric acid** 硫酸 they slow, because the insoluble **sulfate** 硫酸盐 coats the metal.

2 The compounds

Thermal decomposition

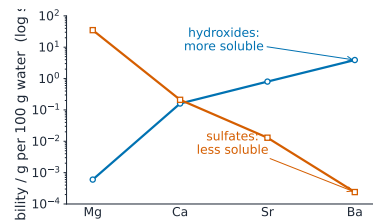
small Mg^{2+} : high polarising power Ba^{2+} : low polarising power



Thermal decomposition 热分解:
carbonates $\rightarrow$ oxide + CO_2 ;
nitrates $\rightarrow$ oxide + NO_2 + O_2 .

Thermal stability 热稳定性
rises down the group – a
larger ion **polarises** 极化
the anion less, so it is
harder to break.

Solubility trends



Down Group 2:

- **hydroxides** 氢氧化物 become **more** soluble ($Ba(OH)_2$ soluble)
- **sulfates** 硫酸盐 become **less** soluble ($BaSO_4$ insoluble)

3

Recap

Worked example – Group 2 with water

Write the equation for calcium with water, and explain the reactivity trend down Group 2.

- $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
- Down the group the outer shell is **further out** and more **shielded** 屏蔽.
- So the two outer electrons are lost more easily – **ionisation energy falls**.
- **Reactivity increases down**: Mg slow in cold water, Ca steady fizzing, Ba vigorous.

Group 2 gets more reactive down because it is easier to **lose** electrons. Group 17 gets **less** reactive down because it is harder to **gain** them.

Topic 10 – key takeaways

1 Reactivity

increases down the group

2 Reactions

form oxides, hydroxides & salts + H_2

3 Thermal stability

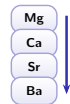
rises down; small ions polarise more

4 Solubility

hydroxides up, sulfates down

Check yourself

- Which way does reactivity change down Group 2?
- What does a carbonate decompose into?
- Which is more soluble, $Mg(OH)_2$ or $Ba(OH)_2$?
- Why is $BaSO_4$ hard to dissolve?



Answers 1. increases 2. the oxide + CO_2 3. $Ba(OH)_2$ 4. sulfate solubility falls down the group