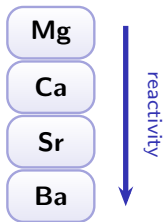


Group 2

A-Level Chemistry ■ Topic 10

A-Level Chemistry



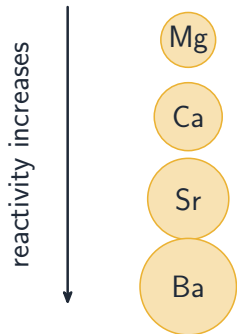
What we will cover

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

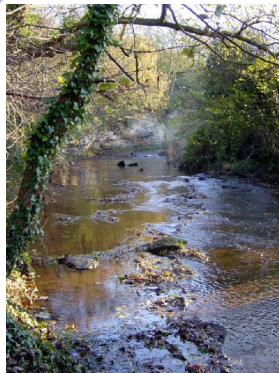


magnesium burns brilliantly

Reactivity down the group



down the group:
atoms get **larger**
⇒ outer 2 electrons
are further out
⇒ **easier to lose**



limestone

Reactions of the elements

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

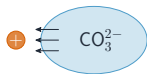
with water: $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

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.

Thermal decomposition

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



distorts the ion
⇒ **decomposes easily**

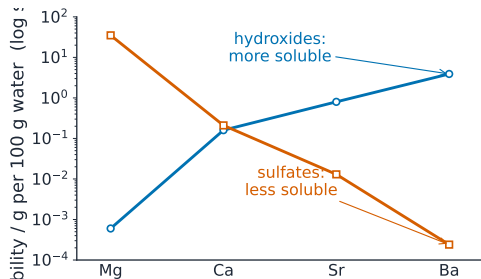


barely distorted
⇒ **thermally stable**

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 ($\text{Ba}(\text{OH})_2$ soluble)
- **sulfates** 硫酸盐 become **less** soluble (BaSO_4 insoluble)

Worked example – Group 2 with water

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

- $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$
- 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

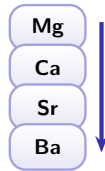
4

Solubility

hydroxides up, sulfates down

Check yourself

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



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