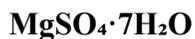


Thermogravimetric Analysis (TGA) of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

Sample:

Magnesium sulfate heptahydrate



Molecular Weight Calculation

$$\text{Mg} = 24$$

$$\text{S} = 32$$

$$\text{O}_4 = 64$$

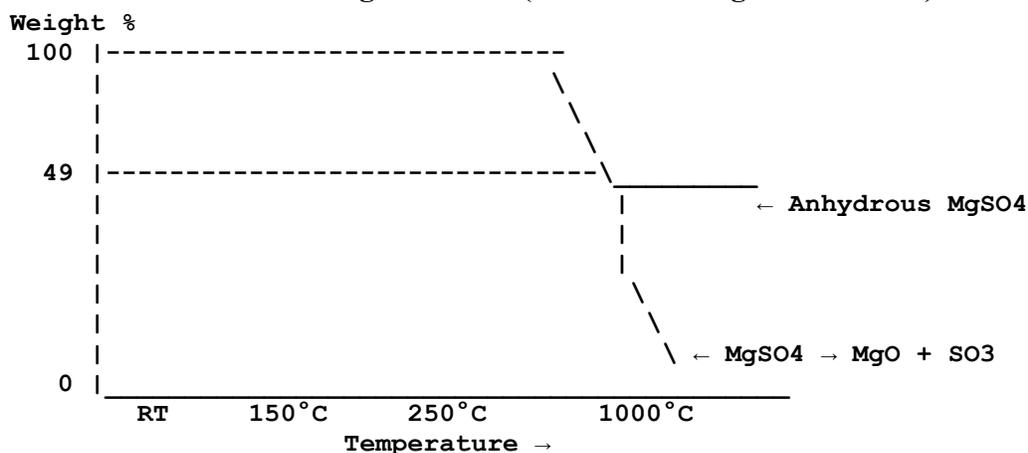
$$7\text{H}_2\text{O} = 7 \times 18 = 126$$

$$\text{Total} = 246 \text{ g/mol}$$

$$\% \text{ Water} = \frac{126}{246} \times 100 \approx 51.2\%$$

So total dehydration \approx **51% weight loss**

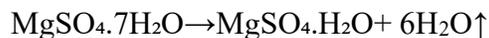
Labeled TGA Curve of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (Draw This Diagram in Exam)



Explanation of Each Stage

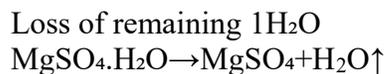
Step-1 (30–150°C)

Loss of $6\text{H}_2\text{O}$ (major dehydration)



Large weight drop begins.

Step-2 (150–250°C)



$$\% \text{ Water: } \frac{126}{246} \times 100 \approx 51.2\%$$

Total dehydration \approx **51%**

Mass decreases from **100%** \rightarrow **~49%**

Residue: **Anhydrous MgSO₄**

Step-3 (250–1000°C)

Stable region (horizontal line)
No weight change.

Step-4 (above 1000°C)

Decomposition:



Thermal decomposition:

Final residue: **MgO**

$$\text{Mass of MgO} = 40.3 \text{ g}$$

$$\text{Residue: } \frac{40.30}{246} \times 100 \approx 33\%$$

Final mass \approx **33% of original mass**

Final residue: **MgO**

Important Exam Points

- Total dehydration \approx **51% mass loss**
 - Anhydrous MgSO₄ stable up to \sim 900°C
 - Final solid = **MgO**
 - Large first mass drop (because 7 water molecules)
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