

Passage III

As calcium oxalate hydrate ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$) is heated, it first dehydrates to yield calcium oxalate (CaC_2O_4). Next, the CaC_2O_4 decomposes into calcium carbonate (CaCO_3) and carbon monoxide (CO). The CaCO_3 then further decomposes into CaO and CO_2 (see equations below).

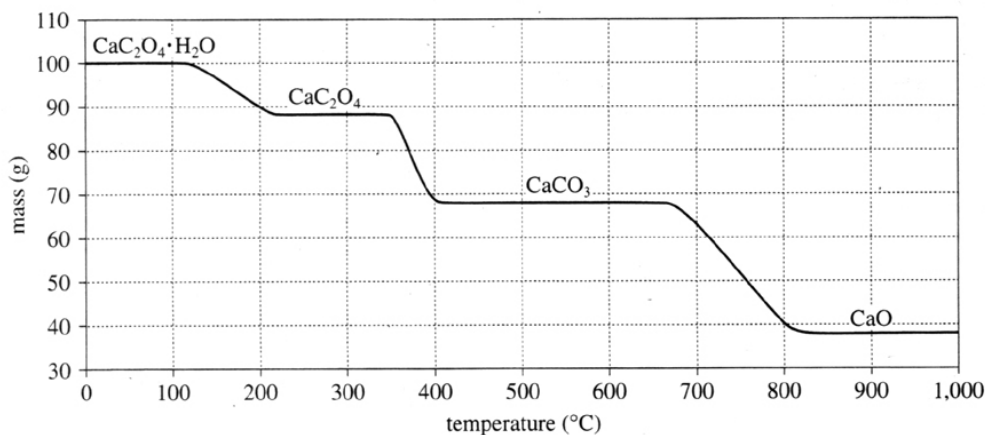
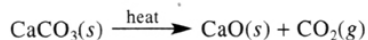
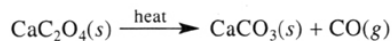
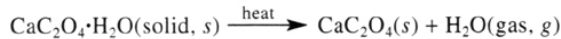


Figure adapted from Mlle. Simone Peltier and Clément Duval, "Sur la Thermogravimétrie des Précipités Analytiques: II. Dosage Du Calcium." ©1947 by Elsevier Science B.V.

13. If the sample of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ had been 50 g, the mass of the sample at 900°C would have been approximately:
- A. 20 g.
 - B. 40 g.
 - C. 60 g.
 - D. 80 g.
14. During the TGA, the largest change in mass resulted from the decomposition of:
- F. $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$.
 - G. CaC_2O_4 .
 - H. CaCO_3 .
 - J. CaO .
15. Calcium oxalate started to decompose at approximately what temperature?
- A. 220°C
 - B. 350°C
 - C. 400°C
 - D. 660°C
16. When the TGA began, approximately what percent of the mass of the sample was made up of H_2O ?
- F. 12%
 - G. 38%
 - H. 62%
 - J. 88%
17. The CO_2 that was part of the reactions that occurred during the TGA could best be described as a:
- A. reactant formed directly by the decomposition of CaC_2O_4 .
 - B. reactant formed directly by the decomposition of CaCO_3 .
 - C. product formed directly by the decomposition of CaC_2O_4 .
 - D. product formed directly by the decomposition of CaCO_3 .

In a *thermogravimetric analysis* (TGA), the mass of a sample is monitored as the sample's temperature is steadily increased. A nonreactive gas is streamed over the sample to carry away any gaseous products. The figure shows the results of a TGA of a 100 g sample of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$.