

Calcium oxalate decomposition under high pressure

Introduction

The influence of pressure over the thermal decomposition behavior of mineral materials is important in order to assess their reactivity and stability. Calcium oxalate monohydrate is a well characterized material frequently used to check the performance of a thermogravimetric analyzer.

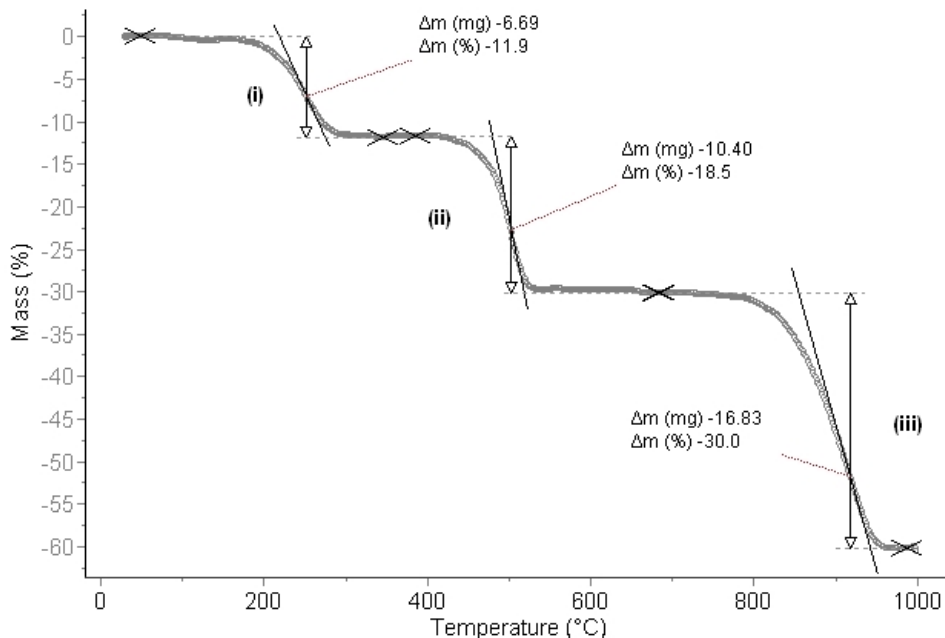


Figure 1 – Mass variations vs. temperature at 50 bar

Experimental

The high pressure version of the THEMYS Thermal Analysis platform was used for this experiment. A 56.1 mg calcium oxalate monohydrate sample was placed in a 1300 μl crucible and heated from 30 to 1000 °C at a rate of 10 °C/min under a flow of nitrogen at 50 bar.

Results and conclusions

The typical three step decomposition behavior of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ is observed, with the loss of one molecule of water per molecule of calcium oxalate monohydrate at low temperature (i), the loss of carbon monoxide at an intermediate temperature range (ii) and finally the loss of carbon dioxide at higher temperature (iii). The results fit well with the theoretical mass losses.

Mass loss	Theory	Experiment
(i)	$M_{\text{H}_2\text{O}} / M_{\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}} = 12.3\%$	11.9%
(ii)	$M_{\text{CO}} / M_{\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}} = 19.1\%$	18.5%
(iii)	$M_{\text{CO}_2} / M_{\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}} = 30.1\%$	30%

Table 1 – Comparison of experimental vs. calculated mass losses

THEMYS HP
RT to 1200°C – up to 150 bar



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