Application Note B-TA1029

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TA1029 - Thermal behavior of calcium sulfate dihydrate by STA

Calcium sulfate dihydrate ($CaSO_4 \cdot 2H_2O$) or gypsum is a natural mineral used in various industrial application. Gypsum is utilized as a retarding agent in cement, construction material for walls and ceilings, surgical splints in medical applications, casting molds and modeling etc. Therefore it is important to understand the thermal behavior of gypsum. Here, we confirm the behavior of calcium sulfate dihydrate using STA (TG-DTA).

Measurement and results

A 10 mg sample amount weighed in a Pt crucible was heated at 20℃/min from RT~1450℃ in air atmosphere flowing at 300ml/min.

Measurement results of $CaSO_4 \cdot 2H_2O$ revealed an overlapping two-stage mass loss of 21% with an endothermic reaction due to dehydration of crystal water ($CaSO_4 \cdot 2H_2O \rightarrow CaSO_4 \cdot 0.5H_2O + 1.5\ H_2O\uparrow \rightarrow CaSO_4 + 0.5H_2O\uparrow$). Then at 362℃, an exothermic peak can be observed due to phase transition from α to β form. As heating continues, an endothermic peak at 1220℃ is detected due to phase transition from β to α form. On the TG curve, a mass loss is gradually observed from 1250℃ due to partial decomposition of $CaSO_4$ ($CaSO_4 \rightarrow CaO + SO_3\uparrow$). From 1280℃, a eutectic mixture of CaO and unreacted $CaSO_4$ as reaction product was formed, followed by further decomposition as indicated by the mass loss on the TG curve. At the end of the measurement, CaO was remained as a residue. ($CaSO_4 \cdot CaO$) → $CaO + SO_3\uparrow$).

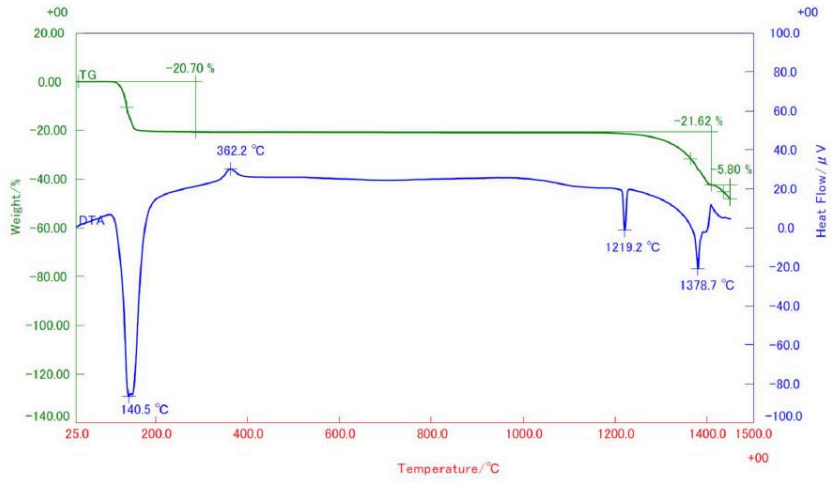

Figure 1: Measurement result of $CaSO_4 \cdot 2H_2O$ by STA (TG-DTA)

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