Application Note B-TA1013

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TA1013 - Mechanically induced amorphization in trehalose dihydrate by STA

Introduction

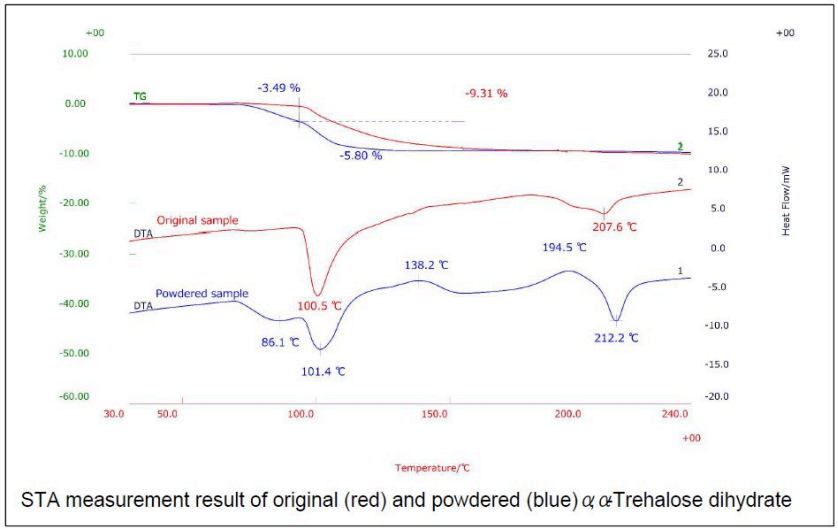
α, α-Trehalose dihydrate is a widely known material in food and pharmaceutical industry. This material can exist in crystalline form, anhydrate form; and amorphous form depending on its particle size. In this application, the use of mechanical method by mortar and pestle was applied to reduce the particle size to fine powder. Here, the STA method is used to confirm the thermophysical changes of powdered α, α-trehalose dihydrate.

Measurements and results

In this experiment, standard reagent of α, α-trehalose dihydrate was used without further purification labelled as original sample. Mortar and pestle was used to produce a fine powder of α, α-trehalose dihydrate labelled as powdered sample. In STA measurement, a 4 mg sample was placed in an open Al pan and heated up to 240℃ at 10℃/min in air atmosphere flowing at 200 ml/min in which the results are shown in Figure 1.

Results reveal that heating the original sample (red curve) exhibited an endothermic peak at 100℃ due to dehydration. At this point, the sample changed to anhydrous trehalose. Then, at 208℃, we can observe an endothermic reaction due to melting.

On the other hand, the powdered sample clearly revealed two overlapping endothermic peaks due to dehydration at 86℃ and at 101℃ due to dehydration. After the dehydration, a change in baseline can be found at 138℃ due to amorphization. An exothermic reaction due to crystallization is observed at 195℃ which is immediately followed by an endothermic peak due to melting at 212℃. This clearly confirms that the fine particles (<45 μm) formed an amorphous phase upon dehydration of α, α-trehalose dihydrate[1].



STA measurement result of original (red) and powdered (blue) α,α-Trehalose dihydrate

Figure 1: STA measurement result of original (red) and powdered (blue) α, α-trehalose dihydrate

Reference

(1) L.S. Taylor and P. York. *J. Pharmaceutical Sciences* **87-3** (2000) 347-355