Application Note B-TA1011

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B-TA1011 - Artificial sweetener and table sugar by STA

Introduction

Table sugar is the common name of sucrose, a glucose derived from plants mainly composed of carbohydrates. On the other hand, artificial sweeteners are synthetic sugars used as substitutes for health purposes which are mostly found in carbonated drinks, beverages and recently available for household consumption. In terms of sweetness, the artificial sugar is found to be significantly higher compared to the table sugar which is usually specified in packaging of the consumer product. In this application, we compare the thermal behavior of table sugar and artificial sweetener by STA method.

Measurements and results

10 mg sample were prepared in a Pt pan and were heated from room temperature up to 600℃ at 5℃/min in dry air atmosphere flowing at 300 ml/min. Figure 1 shows the STA measurement results comparing the thermal behavior of table sugar and artificial sweetener. The STA of table sugar shown in blue curve reveals an endothermic peak at 187℃ due to melting with an enthalpy of 74 J/g. After the melting reaction, we can observe a 3-stage mass losses at 213℃ associated with endothermic reaction due to dehydration, followed by two exothermic reactions at 325 ℃ and 519℃ due to caramelization and combustion of carbohydrate, respectively. At the end of the measurement near 600℃, the table sugar exhibited a 100% mass loss.

On the other hand, the STA result of the artificial sweetener drawn in red curve exhibits a simple thermal behavior with an endothermic reaction at 120℃ due to melting with a enthalpy of 230 J/g which is nearly three times higher compared to the melting of table sugar. It is then followed by a single mass loss with an endothermic peak at 271℃ due to evaporation and a 100% mass loss can be observed at 300℃. Since artificial sweeteners do not contain carbohydrates, we cannot observe the exothermic reactions due to caramelization and combustion. The STA method could be an essential tool in detecting contamination with counterfeit artificial sweeteners.

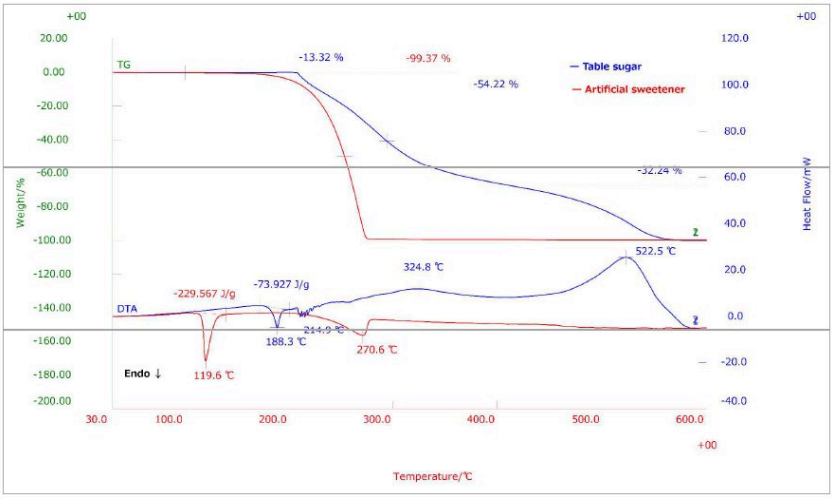

Figure 1: STA measurement results of artificial sweetener and table sugar