Application Brief

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Thermal Analysis of Candy

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Caramel and Chewing Candy

1. Introduction

Thermal analysis is widely used in the food industry to analyze the crystallinity and melting temperature of raw materials, as well as evaluate thermal stability. Food products are composed of various ingredients so their characteristics may differ not only due to the properties of the individual ingredients but also due to changes in the ratios of the ingredients.

In this brief, differential scanning calorimetry (DSC) and dynamic mechanical analysis (DMA) were used to evaluate the characteristics of caramel and chewing candy.

2. Measurement

The samples were commercially-available caramel and chewing candy.

Measurements were performed using the DSC6220 differential scanning calorimeter and DMS6100 dynamic mechanical spectrometer.

For the DSC measurements, a 10mg sample was heated, cooled and then heated again at a rate of 10 ° C / min in an aluminum open sample pan.

For the DMA measurements, compression/ sinusoidal oscillation mode was used. The heating rate was 2 ° C / min and the frequency was 1 Hz.

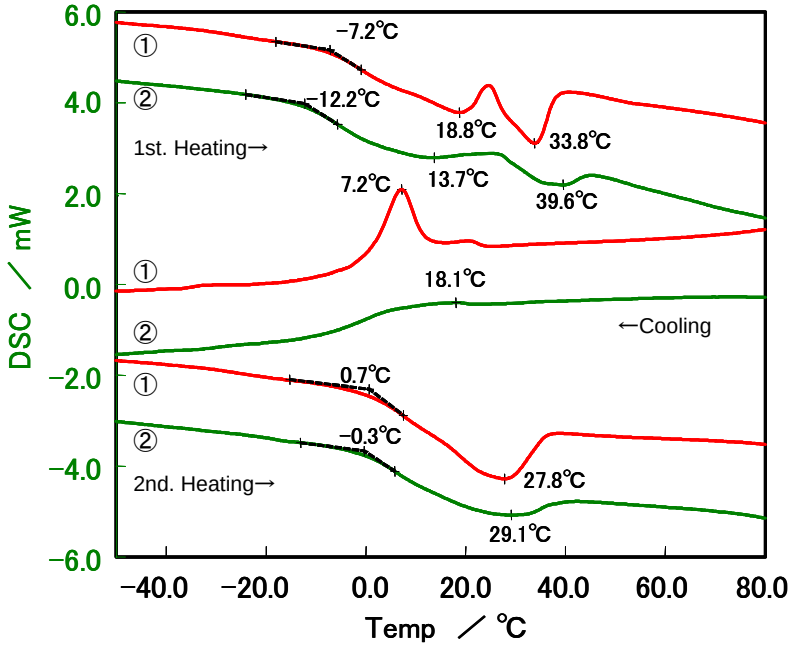

Figure 1 DSC results

①: Caramel ②: Chewing candy

3. Results

3.1 DSC results

Figure 1 shows the results for the two samples. The glass transition of the glutinous starch syrup, which is the main ingredient in both samples, shifts the DSC lines during both heating and cooling. An endothermic peak from heating and an exothermic peak from cooling appear near room temperature. These are likely the peaks of the melting and crystallization of the oil in the samples. The endothermic and exothermic peaks were sharper for the caramel than the chewing candy, so the caramel likely contains more oil.

3.2 DMA results

Figure 2 shows the DMA results. The storage modulus (E') of both samples started to fall around 0 ° C. This was likely due to the glass transition of glutinous starch syrup, as was seen in the DSC results.

After glass transition, E' continued to fall, even above room temperature. This shows that the melting oil further softened the candy.

Under 40 ° C, E' was higher for caramel than chewing candy, which may explain why caramel seems hard after it is placed in the mouth.

4. Summary

Caramel and chewing candy were measured using DSC and DMA. DSC measurement can show the glass transition, melting and crystallization of individual ingredients and DMA measurement can show the influence of ingredients and additives on hardness.

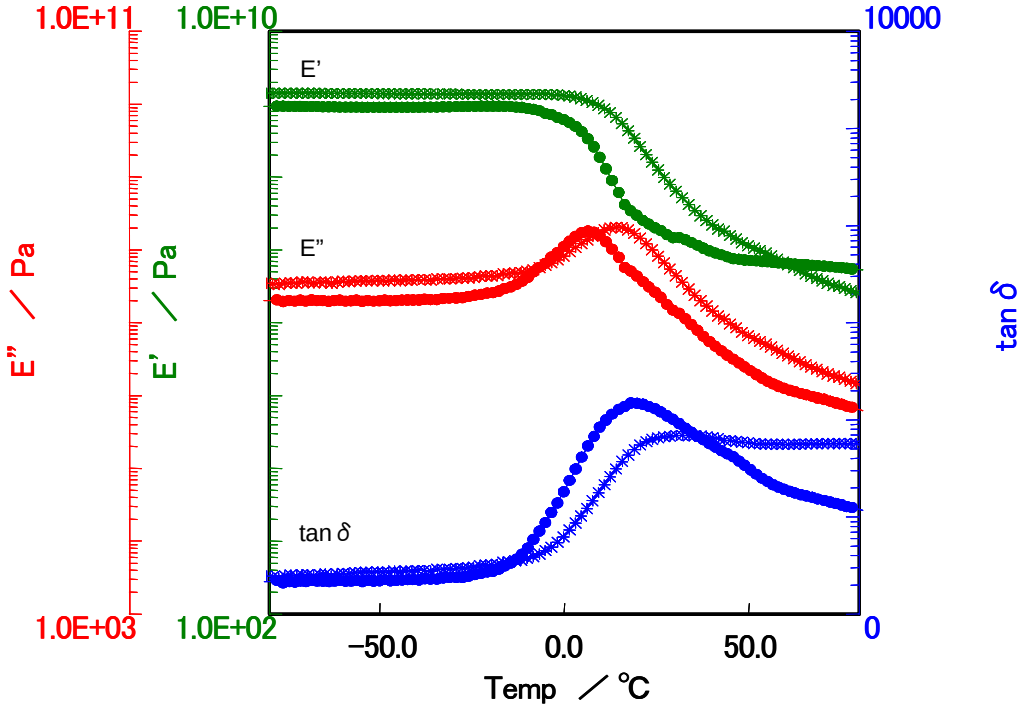

Figure 2. DMA results

∗: Caramel ●: Chewing candy