

APPLICATION NOTE

Chocolate – Rotational Rheometry

Crunchy or Smooth? How Temperature Affects the Mastication Properties of Chocolate

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Introduction

How do you like your chocolate? Straight from the fridge for a satisfying crunch? Or slightly warmer for a smoother mouthfeel? The temperature of chocolate significantly influences the sensory experience during biting and chewing.

Measurement Conditions

This sensory perception can be quantified using the axial capabilities of the Kinexus rotational rheometer equipped with a parallel plate geometry setup. A controlled downward and upward movement of the upper plate simulates jaw motion during mastication.

To illustrate this, a piece of chocolate was placed on the lower plate of the rheometer. The initial gap (distance between the upper and lower plates) was set to 3 mm. The upper plate then moved downward at a constant speed of 30 mm/s to a nominal gap of 1 mm before

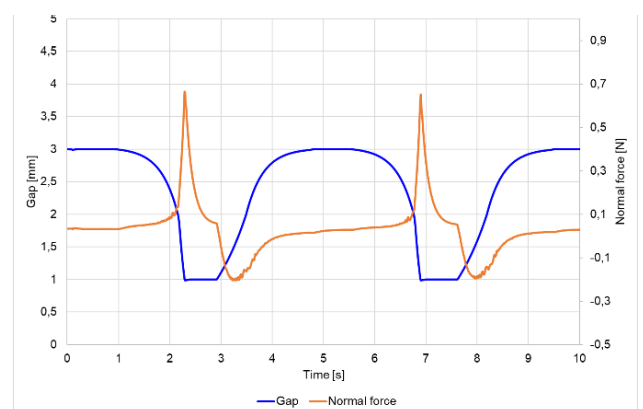
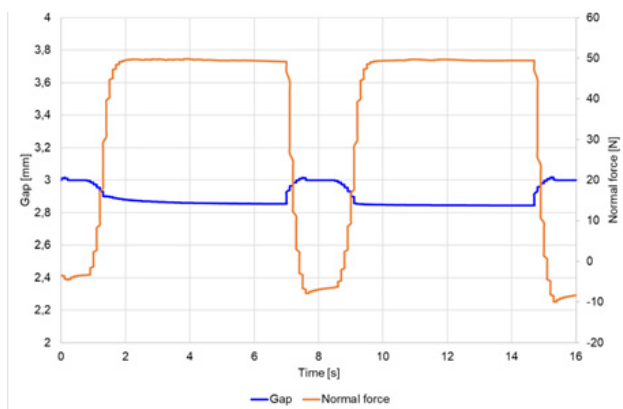
returning to its initial position. The normal force required for this movement was recorded, and this cycle was repeated one time. The test was conducted on chocolate at 10°C (refrigerated) and 35°C (mouth temperature).

Measurement Results

Figure 1 shows the variation in gap size (blue curve) and the force required to reach it (orange curve). As expected, the higher the temperature, the more easily the chocolate is compressed. At 10°C, a force of 50 N resulted in only a 150 µm compression, preventing the upper plate from reaching the target 1 mm gap. In contrast, at 35°C, only 3.7 N was needed to compress the chocolate to 1 mm.

Conclusion

These results highlight the significant impact of temperature on the chewing sensation and emphasize the importance of proper storage for an optimal chocolate experience.



1 Simulation of mastication, performed on chocolate at 10°C (left) and at 35°C (right).