



How Does Chocolate Feel in the Mouth? A Simulation by Means of Kinexus

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Introduction

Rotational rheometers with sensitive normal force control and high data rate do not only perform classical rheological tests, but also allow for quantification of sensory perception. For example, the Kinexus rotational rheometer is capable of mimicking the action of the tongue against the palate during chocolate melting in the mouth.

Measurement Conditions

In the following study, the mouth feel and melting behavior of a milk chocolate (for direct degustation) and dark chocolate (for cake coating) are compared. A piece of chocolate which was placed on the lower plate of the rotational rheometer was heated in order to mimic warming in the mouth. A normal force of 5 N was applied on the upper plate to simulate the tongue pressing on the chocolate. Table 1 summarizes the test conditions.

Table 1 Measurement conditions

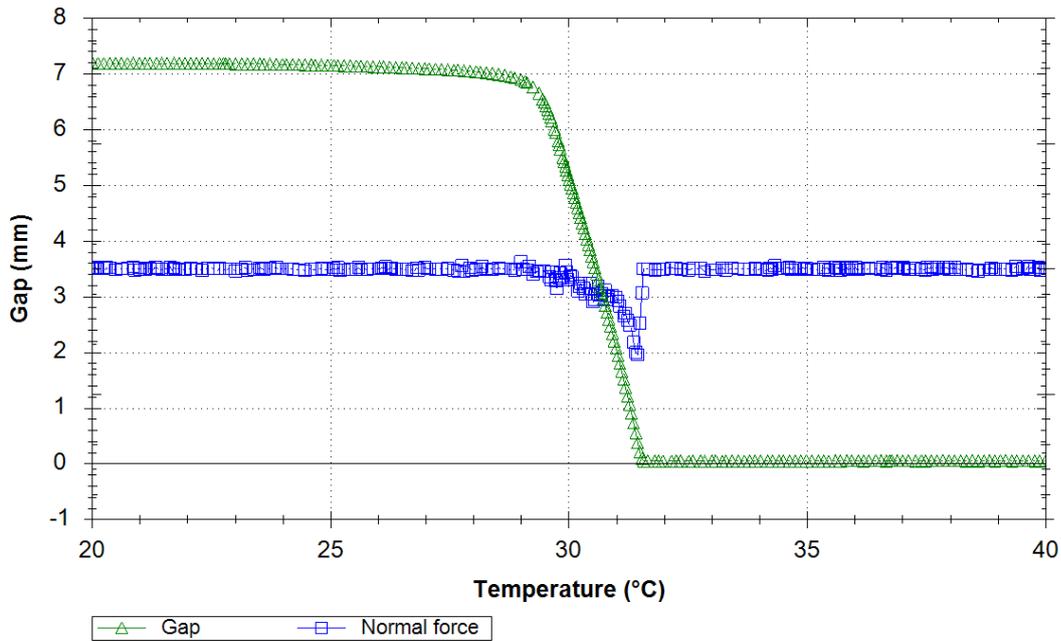
Device	Kinexus Rotational Rheometer
Geometry	PP8 (plate/plate, diameter: 8 mm)
Starting gap	7.2 mm (milk chocolate) 10.5 mm (dark chocolate) Variable gap during the measurement
Normal force	5 N (variable gap)
Temperature range	-20°C to 40°C, 2.5 K/min
Frequency	1 Hz
Shear stress	100 Pa

Measurement Results

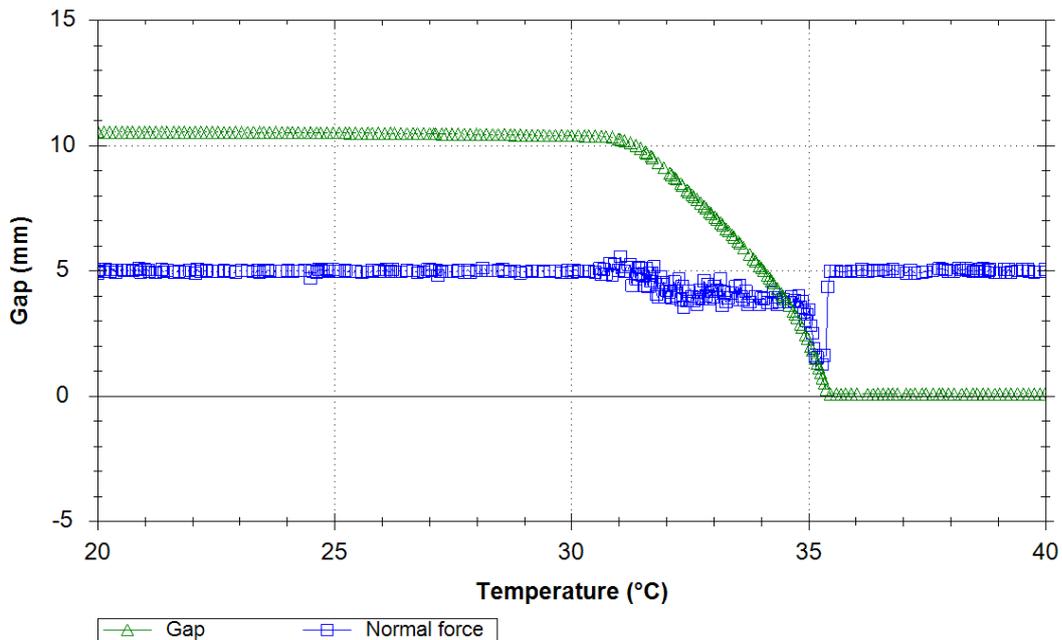
Figure 1 depicts the curves of the gap and normal force during heating the milk chocolate. Providing the sample is in a solid state, the gap remains constant and corresponds to the height of the chocolate piece. The gap decrease between 29°C and 31.5°C results from the

chocolate melting. This process is detected very accurately due to the high data rate and the precise normal force control.

Figure 2 displays the curves measured for the dark chocolate.



1 Milk chocolate. Simulation of melting in mouth

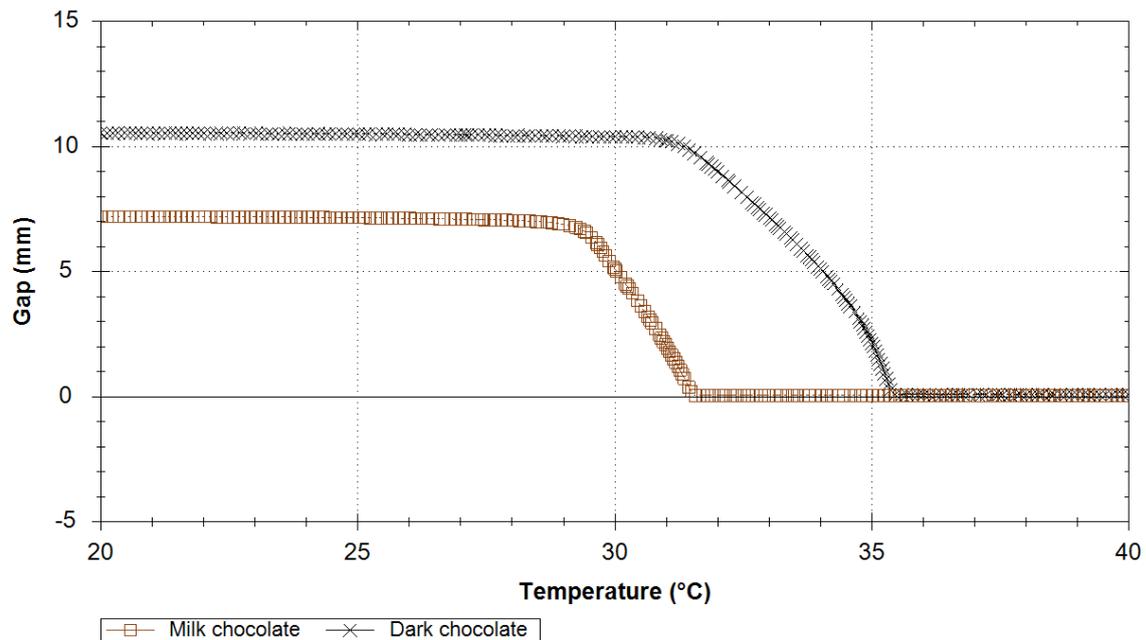


2 Dark chocolate. Simulation of melting in mouth

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Figure 3 compares the gap of both samples during the temperature ramp. The dark chocolate starts melting later than the milk chocolate (the gap begins to decrease at 31°C) and takes longer by almost 4.5°C, vs. only 2°C

for the milk chocolate. This means as a consumer we will experience chocolate melting and flowing in the mouth faster for the milk chocolate than that of the dark chocolate.



3 Comparison of milk and dark chocolate

Conclusion

The high data rate, together with the normal force capabilities of the Kinexus rotational rheometer, enables the

detection of rapid gap changes of chocolate during melting. Such measurements are useful to simulate the behavior of chocolate in the mouth, and thus to quantify sensory perception.