Monitoring chocolate quality evolution during storage

Introduction

At the end of the production, approximately 70 percent of fats only are crystallized in chocolate. To ensure a great quality, it is important to follow not only the process but also what happens afterwards, during the storage.
Temperature of storage is very important because uncontrolled conditions may cause the fat to set in the wrong crystalline form, leading to further blooming.
In this application note, we explore the capacity of RHEOLASER Crystal to study the behaviour of chocolate during storage, thus monitoring bloom formation.

KEY BENEFITS

- VERSATILE
- ACCURATE
- EASY

Method

In this work, we followed the evolution, during storage, of non-tempered chocolate. A series of non-tempered black chocolates were prepared, in same time, and crystallized under low temperature to favor unstable crystals.

Chocolate were stocked at 21°C and each day a different piece (small piece of approximately 1 cm^2) was analyzed with a RHEOLASER Crystal.

Samples were heated from 16°C to 40°C at a speed of 3°C per minute to control the evolution of the crystalline form.

Technical reminder

The RHEOLASER Crystal technique is based on MS-DWS. Please refer to the technical note TN-05 for more information.

Experimental results

- Evolution over time of a non-tempered chocolate

By analyzing samples according to the method described in the previous paragraph, the following results were obtained:

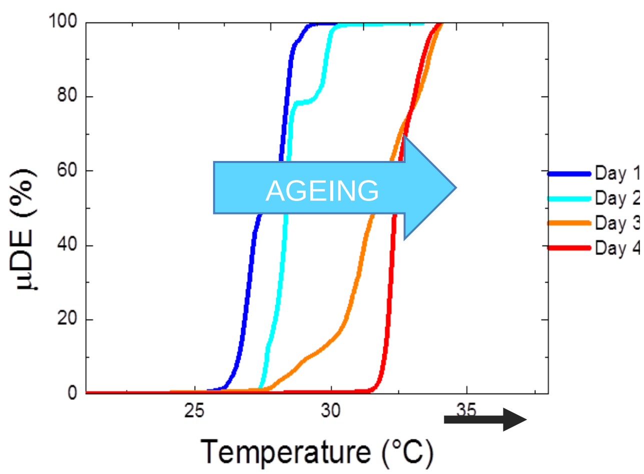

Figure 1: Micro-Dynamics Evolution in function of temperature for a non tempered black chocolated stored at 21°C.

Figure 1 shows that the non-tempered chocolate evolves to a more stable form, leading to the blooming of the chocolate.

Day after day, the analysis shows an increase of the average transition temperature. This increase is due to polymorphic transitions occurring during storage.

The first day, Average temperature of transition was 28.6°C, the second day the transition temperature was 29.5°C.

The third day, transition temperature was 32.7°C and the final day transition temperature was 33.5°C.

The higher temperature corresponds to the β(VI) form, the undesirable stable form of chocolate.

Figure 2: Photography of a bloomed chocolate.

After 1 week of storage, the chocolates were completely bloomed, which was confirmed visually.

With RHEOLASER Crystal we can analyse chocolates few days after production, to control the evolution of crystal structure. The sampling of approximately 1 cm^2 avoid denaturation of chocolate and allows to work on multi-component systems easily.

Table 1: Average transition temperature (T50) of chocolate samples.

Sample	Transition temperature (°C)	Blooming
Day 1	28.6	No
Day 2	29.5	No
Day3	32.7	Beginning
Day 4	33.5	Yes

CONCLUSION

Thanks to the RHEOLASER Crystal, we can follow the evolution of chocolate under different storage conditions.

At the end of the process (after the cooling) a part of the fat is still liquid in chocolate, and can still evolve. With RHEOLASER Crystal it is possible to optimize storage conditions by tracking the evolution of crystalline forms of chocolate during time. This kind of analysis would be really tricky with another technique, as the crystalline form of the fat is very sensible to shear (during sampling for instance).