Chocolate Bloom Investigated by SWAXS/DSC

Daniel J E Kalnin, Hanna Dahlenborg, Heinz Amenitsch
YKI, Institute for Surface Chemistry, Stockholm, Sweden
Austrian Academy of Sciences, Outstation ELETTRA Synchrotron, Bassovizza, Italy

The aim of this time and temperature resolved study is to investigate phase stability and phase transitions in Cocoa butter (CB). Since Fat bloom is strongly related to the quality misfit in chocolate and confectionary industry, effort is taken to understand phase transitions, especially in lipids yielding fat bloom.

For this work strongly bloomed chocolate pralines were used in such a way that the praline core was investigated separately from the fat bloom at the surface. The white fat bloom that was formed on the surface is distinguishable from the chocolate praline and therefore separable by scratching the surface. The so yielded amount of separated CB was analyzed in the respect of phase stability. Briefly SWAXS/DSC was carried out on three different samples of white, milk and dark chocolate from industrially manufactured chocolate pralines. Those pralines were stored at 20 ºC prior to analysis.

In a related study profilometry, Low vacuum SEM and confocal Raman microscopy was used (Dahlenborg et al) in order to analyze the surface of chocolate pralines.

Here the instrumental setup is Microcalix calorimeter at SAXS beam line at ELETTRA synchrotron. One of the problems while analyzing chocolate using combined small and wide angle scattering on commercial chocolate is the “artefact” diffraction of the sugar crystals. This can be worked around by scratching off surface bloom which in our case only contained fat and no sugar crystals. This microscopic observation was proven by the absence of WAXS reflections. 3L 1 shows the clear melting behaviour of CB form VI upon heating. However normal CB crystallization behaviour can also be seen upon subsequent cooling. With the respect to crystallization behaviour, bloomed CB crystallizes quite as the underlying surface which probably shows that the composition that influences crystallization behaviour is just the same just beyond the surface. Hence only a part of the fat bloom actually shows in form of detectable surface bloom crystals. Prior studies clearly indicate that migration phenomena play a role in praline blooming; however we are not able to identify the compositional impact form the crystallization point of view. Further, it would be necessary to understand what happens underneath the immediate surface (20 m) throughout the whole praline or a bloomed chocolate.