Understanding Cocoa butter solidification patterns through technological advances in calorimetry

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Differential Scanning Calorimetry has long been used to study the different crystalline structures that cocoa butter solidifies into. The invention of the isothermal calorimeter, facilitated the recording of real time data for long periods of time. This has been of special interest in the study of cocoa butter solidification and in turn fat bloom in chocolate.

Chocolate, as a topic of study, is as interesting as the lovable snack it has always been. The smooth, firm and cooling sensation it has in the mouth depends on the quality of fat present in the chocolate. The most common fat used in chocolate is cocoa butter that is extracted from the same beans as cocoa powder itself. Cocoa butter is known to have a rather moody solidifying pattern, mostly depending on the temperature it solidifies at. Getting the cocoa butter to solidify into a specific pattern is very important to get the perfect gloss, snap as well as avoid it from completely melting off in your hand rather than your mouth. When chocolate is cooled or stored improperly,

it results in a grayish-white film that appears on the surface of chocolate called bloom. Bloomed chocolate is still safe to eat, but will have an unappetizing appearance and surface texture.

My study involved setting up a method to use an isothermal calorimeter to study the solidification patterns of cocoa butter. It functions by recording the energy involved in the solidification of cocoa butter over long periods of time. This equipment maintains a constant temperature throughout the measurements to reduce the effect of un-related energy changes. In my studies, I was able to establish the necessity for a good quality, homogenous cocoa butter in the production of good quality chocolate. I also show the importance of certain steps; such as seeding, in manufacturing good quality chocolate. Seeding involves dissolving a piece of perfectly solidified chocolate in cooled, yet molten chocolate to promote the solidification of the entire batch into a product that has the desired characteristics. By the use of the isothermal calorimeter, it was clear that not seeding a sample resulted in varied solidification patterns and products with different melting points and unappetizing appearances. When these samples were seeded, it resulted in uniform products in terms of heat of solidification, appearance and melting point. By setting up a basic method to use the isothermal calorimeter with seeded samples, representing well manufactured chocolates, future studies can involve recording heat changes that occur in blooming due to improper storage.