

# **Ultrasonic Wave Propagation in Cocoa Butter during Crystallization**

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In the production of fat containing food products, insight in the crystallization behavior of fats is of utmost importance to obtain the desired product functionality and product quality. Several methodologies exist to follow the crystallization. In particular non-destructive techniques, such as ultrasonic waves, are interesting in a production environment since these allow for in-line measurements. The aim of the research is to study the potential of advanced ultrasonic techniques to monitor fat crystallization. Ultrasonic waves are acoustical waves with a frequency higher than the upper limit of human hearing. When propagating through a medium, they interact with its internal structure and have the ability to gather important information about its microstructure. Most research up to now deals with longitudinal transmission measurements of the solid fat content. In this research however reflection experiments are carried out with shear waves. A sample holder was custom build with a Plexiglas delay line and a temperature control unit. The main advantages of this experimental set-up are that no problems with excessive attenuation of the fat arise and that shear ultrasonic reflectance, unlike longitudinal measurements, seems sensitive to changes in microstructure. The results obtained with ultrasonic measurements are compared with the results of traditional measurement techniques to follow the crystallization of fats, like DSC and microscopy. In this way, the most appropriate parameters of the ultrasonic signal to monitor fat crystallization can be deduced.