



overview

Today's consumers are becoming increasingly discerning about the foods they choose to buy and the food industry is challenged with creating products that cater for a wide range of tastes and lifestyles. Food safety is an important concern and the more the public know about how their food is produced the greater their confidence will be.

The quality of food products has to be consistently high for customers to become loyal to a particular brand over others in the marketplace. By building brand loyalty, food manufacturers can establish and increase their market share and improve their profits.

When it comes to perfecting the taste, texture and appearance of food, manufacturers are increasingly turning to experimental methods that enable them to analyse material at the sub-micron and molecular level.

Through a greater understanding of how ingredients are behaving at the molecular level during production, the optimum conditions for manufacture can be realised. This in turn should lead to increased profits and better tasting food.

Key Challenges

- Process optimisation**
 Using small angle X-ray scattering, production processes can be studied in-situ. The level of detail this provides gives a greater understanding of the process and allows the discovery of optimum manufacturing conditions.
- Resource and cost savings**
 By improving our understanding of manufacturing processes, it becomes easier to identify energy and production cost savings thus improving profitability.
- New product development**
 The molecular information provided by small angle X-ray scattering offers limitless potential for new and improved food products.

The Synchrotron Solution

The synchrotron offers experimental techniques that cannot be found in traditional laboratories. These techniques can help improve existing products, reduce energy and manufacturing costs, and develop new and innovative products for the future.

Techniques

Non-crystalline diffraction offers the high resolution required to investigate materials under controlled environments, mimicking industrial processes (eg high pressure and/or temperature). High-resolution X-ray diffraction can be used to investigate the structure of surfaces and interfaces under different environmental conditions.

Beamlines: I22 Non-crystalline diffraction and I07 Surface & Interface Diffraction

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case studies

Making better chocolate

Food manufacturers can learn a great deal from investigating their processes at a very detailed level.

The solidification process in the production of chocolate is known as tempering. It requires very careful control because it significantly influences properties which determine the workability of the process and the physical properties of the end product such as gloss, texture, heat resistance, snap and fat bloom stability.

Food scientists from "the nation's favourite" chocolate manufacturer Cadbury enlisted the help of Heriot-Watt University and the current UK synchrotron (SRS) based at Daresbury to expand their knowledge of the chocolate-making process at the molecular level.

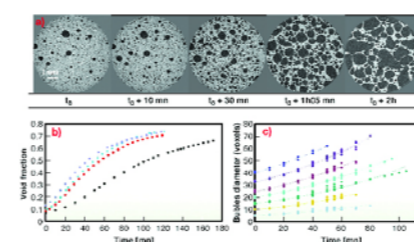


Prof Kevin Roberts, who led the research, explains, "We used small angle x-ray scattering and were successful in following the crystallisation of pure cocoa butter in real time. The results showed the optimum conditions for chocolate manufacture".

Source: Prof Kevin Roberts k.j.roberts@leeds.ac.uk

Pain au synchrotron

The French are famous for their fresh bread so it is no surprise that the creation of this national staple has been studied in detail at the European Synchrotron Radiation Facility (ESRF) in Grenoble. The consumer's appreciation of solid food foams such as bread is strongly linked to their texture. Bubble growth and coalescence phenomena during fermentation and baking govern bread texture creation, which in turn determines mechanical properties as well as sensory properties like their feeling in the mouth. Mechanisms governing the cellular structure development and setting need to be better understood, which requires a systematic and accurate mapping of microstructural characteristics. Researchers from the Institut National Polytechnique de Grenoble and the Institute National de la Recherche Agronomique used in situ X-ray tomography in order to assess the bubble structure development during the fermentation and baking of bread dough.



The information that was obtained will enable industrialists to improve their quality control and meet consumer demands more effectively.

Source: ESRF www.esrf.fr

