

3D IMAGING AND ANALYSIS OF AERATED FOODS PRODUCTS USING X-RAY MICROTOMOGRAPHY

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Air is an important component in many food products. Air creates an open structure resulting in novel textures, enhanced taste perception and attractive appearance. It is cheap and will add no calories. Soft foams such as whipped cream, aerated desserts and mousses contain separate gas bubbles in medium viscosity liquids or semi solids. However many food products are like sponges, in which nearly all bubbles are interconnected to give a porous network with a continuous gas phase. Examples are bread, cake and biscuits. Air can be incorporated into the product by a large variety of methods which may be specific to one or more food types, e.g. whipping, mixing, fermentation, chemical agents, freeze drying, puffing, extrusion, frying and gas injection. The microstructure will not only influence sensory properties but also the stability, shelf-life and preparation time of the products. A detailed understanding is needed of the relation between microstructure and product properties. This presentation describes a study that uses X-ray microtomography (μ CT) for the characterisation and visualisation of the 3D microstructure of aerated desserts (figure 1), ice cream (figure 2), chocolate bars, dried vegetables, puffed rice and bread. 3D image analysis (IA) methods were used to obtain quantitative information.

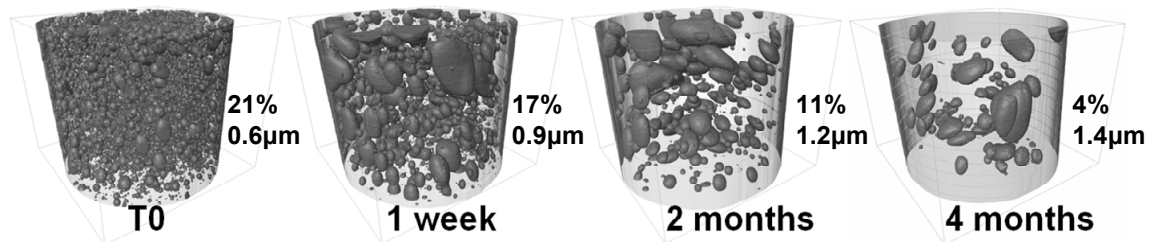


Figure 1: μ CT images of an aerated dairy sample after preparation (T0) and storage (21% of air was added to the product): 3D surface rendering of bubbles in dark grey and matrix in light grey (cylinder with a diameter of 11mm and height of 10 mm) with analysed volume fraction of air (%) and volume weighted mean bubble diameter (μ m).

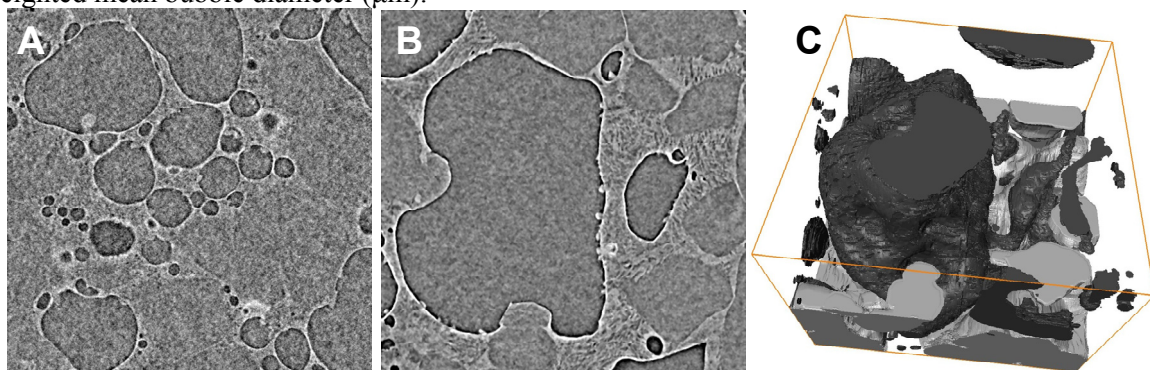


Figure 2: Synchrotron μ CT images ($512 \times 512 \text{ px}^2 = 0.30 \times 0.30 \text{ mm}^2$) of fresh ice-cream (A) and "temperature-abused" ice cream (B&C), clearly showing the large ice crystals and air bubbles after the temperature cycling (C: surface rendering of air (dark grey) and ice crystals (light grey) clipped at 50%, box = $512 \times 512 \times 380 \text{ px}^3 = 0.30 \times 0.30 \times 0.23 \text{ mm}^3$).