Application Note B-XRI1023

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B-XRI1023 - Analysis of potato thickness and oil particle size in potato chips by micro X-ray CT

Introduction

The amount and structure of food ingredients affect taste and texture. Various microscopes are used to observe the internal structure of food, but it is difficult to cut out cross sections and calculate ingredient amounts while preserving fragile structures. X-ray CT can calculate ingredients sizes and volume fractions from the volume data of a sample and observe arbitrary cross sections. Potato chips with different structures were scanned and the volume fractions of potato, oil, and salt were analyzed, as well as the thickness of potato layers and the size of the oil particles.

Measurement and analysis

Potato chips with different textures soft, "S," and crispy, "C," were scanned at 3.6 µm/voxel for 30 minutes. 3D rendered images of potato, oil, and salt in a 5 mm square area are shown in Figure 1. The volume fractions are shown in Table 1.

Table 1: Volume fractions of ingredients (vol%)

	Potato chips "S"	Potato chips "C"
Potato	68.0	65.7
Oil	31.8	33.9
Salt	0.2	0.4
Total	100	100

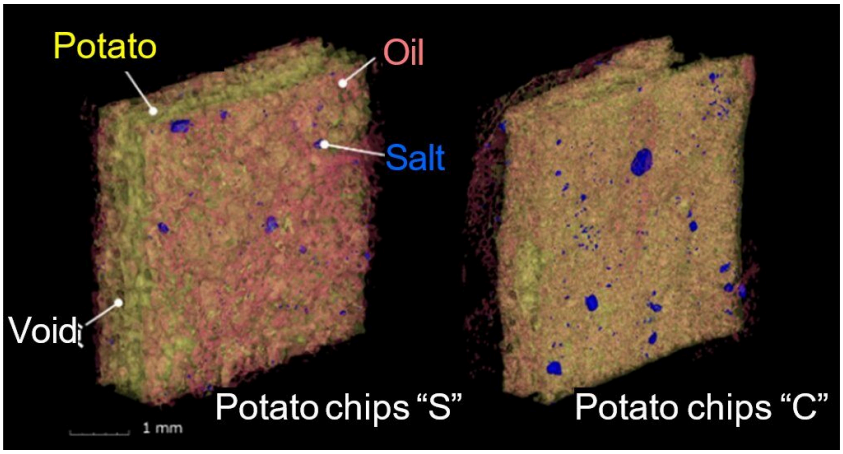

Figure 1: 3D rendered images of potato chips

Next, the potato thickness and oil particle size were calculated and color-coded by size on the CT cross-section (Figure 2). A layer structure of approximately 150 µm parallel to the potato chip surface was observed in potato chips “S”, as shown in the upper images. Oil particles are located near the surface. The inner oil-free potato layer and large air bubbles may give the chips their soft texture. On the other hand, potato chips “C” shown in the lower images had no layer structure and consisted of a mixture of oil, potato, and voids of various sizes.

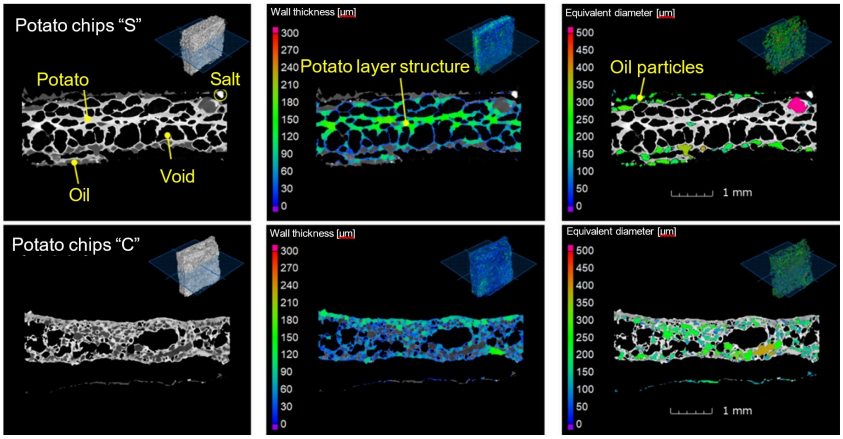

Figure 2 CT cross-sections of potato chips (left: gray scale images, middle: potato thickness distribution, right: oil particle size distribution)

Recommended equipment and software

- 3D micro X-ray CT CT Lab HX
- Industrial X-ray CT data analysis software VGSTUDIO MAX (Wall thickness analysis module, foam/powder analysis module)

Related products

CT Lab HX

High-resolution benchtop microtomography of large samples