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Application News

inspeXio™ SMX™-225CT FPD HR Plus Microfocus X-Ray CT System

Example of Observing Instant Noodles Using a Microfocus X-Ray CT System

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User Benefits

- The complex three-dimensional shape of dried noodles can be easily observed non-destructively, which is useful for product research and development and quality control.
- The density of noodles can be evaluated by calculating the volume fraction of noodles in a three-dimensional representation.

■ Introduction

Instant noodles were born in Japan in 1971. They are now consumed widely around the world because of the convenience of being able to eat them anywhere after just adding hot water and waiting for a few minutes, their excellent storability due to advanced drying and packaging techniques, and their low price.

Instant noodle manufacturers are constantly conducting research to develop products that are both easy to prepare and delicious. In order to develop products that will be popular with many consumers, it is important to consider the type and quantity of ingredients and the manufacturing method. However, even if the same ingredients are used, the shape and structure of the noodles change the way heat is conducted, which results in changes to the required cooking time and taste. Therefore, research and development on the shape of the noodles and quality control are essential to developing products that can be prepared deliciously in a short time. However, noodles have a complex three-dimensional shape, so it is not easy to visually observe their intricate internal structure.

A useful tool for observing the complex shape of noodles is the micro-focus X-ray CT system. An X-ray CT system can easily visualize the three-dimensional structure of the object non-destructively.

Here, an example of observing the inside of instant noodles using the inspeXio SMX-225 CT FPD HR Plus microfocus X-ray CT system (Fig. 1) is presented.

Fig. 1 inspeXio™ SMX™-225CT FPD HR Plus microfocus X-ray CT system

■ Observation of Instant Noodles

Fig. 2 shows a cross-sectional image and a three-dimensional representation obtained by CT imaging a cup of instant noodles. Sectional images 1 and 2 show cross-sections at different heights, and sectional images 3 and 4 show vertical sections perpendicular to each other. Sectional images are white where density is high and black where density is low. Ingredients are visible on top of the noodles in the top cross-section.

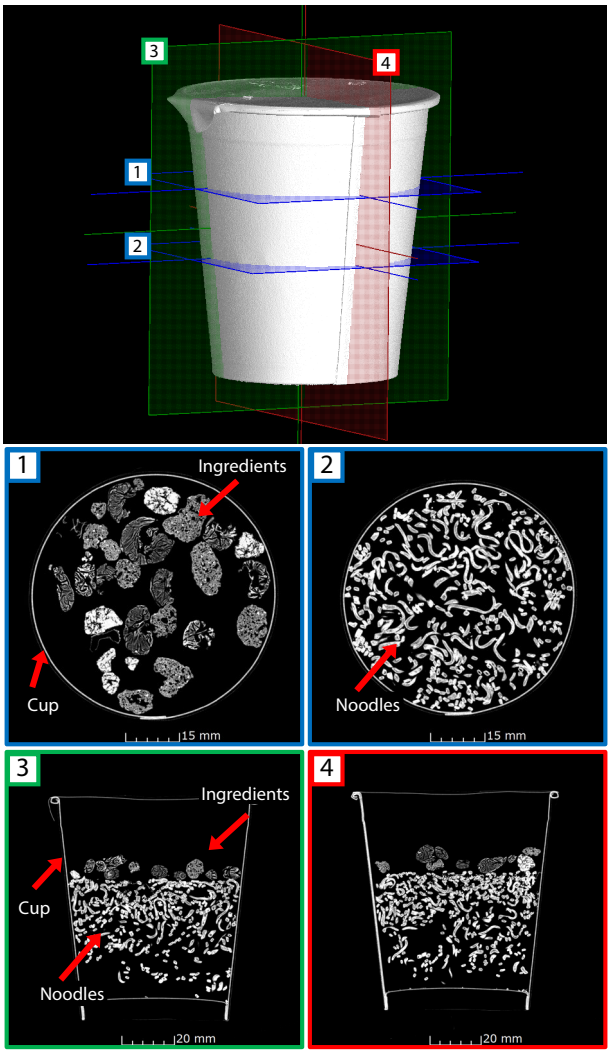

Fig. 2 Sectional image and three-dimensional representation of a cup of instant noodles

Fig. 3 shows three-dimensional representations of the cup made semi-transparent so that the inside of the instant noodles can be easily observed. Images 1, 2, and 3 show images viewed from an angle, front, and side, respectively. Images 2 and 3 indicate there is a large gap between the bottom of the noodles and the cup, and the noodles float in the middle of the cup.

Fig. 4 shows a three-dimensional representation and cross-sectional images of four frusto-conical regions at regular intervals in the height direction to observe the density of the noodles. As can be seen from cross-sectional images, the noodles are denser at the top of the cup. Fig. 5 shows the result of calculating the volume percentage of noodles by measuring the volume of the frusto-conical regions and the volume of noodles in each of the four areas. Of the four regions, the volume fraction in the top region, 1, is more than three times larger than the value in the bottom region, 4. Since the density of the lower part is smaller than that of the upper part of the noodles when hot water is poured into the noodles, convection is more likely to occur, making it easier for heat to be transferred throughout the noodles.

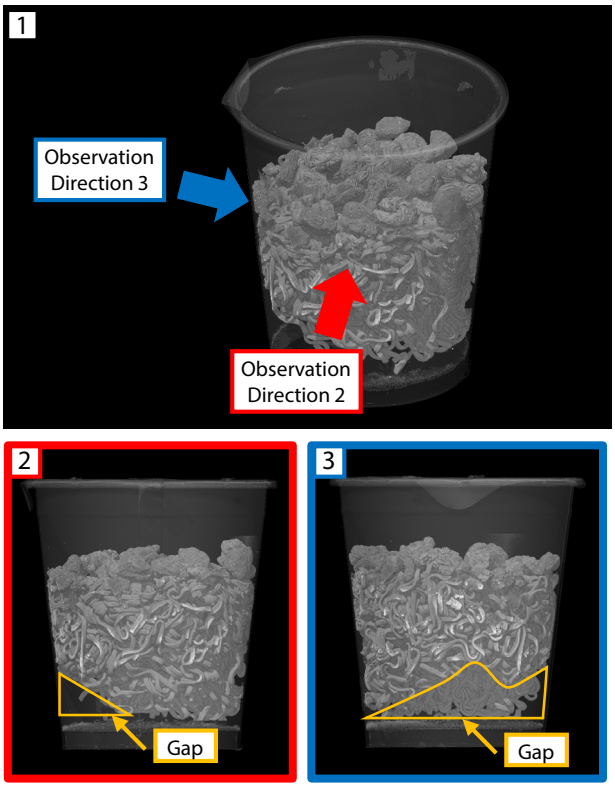

Fig. 3 Representation of the instant noodles

■ Conclusion

As demonstrated in this example, the micro-focus X-ray CT system can be used to observe the complex structure of dried noodles, calculate the volume fraction of noodles, and examine the density distribution, which is useful for product research and development and quality control.

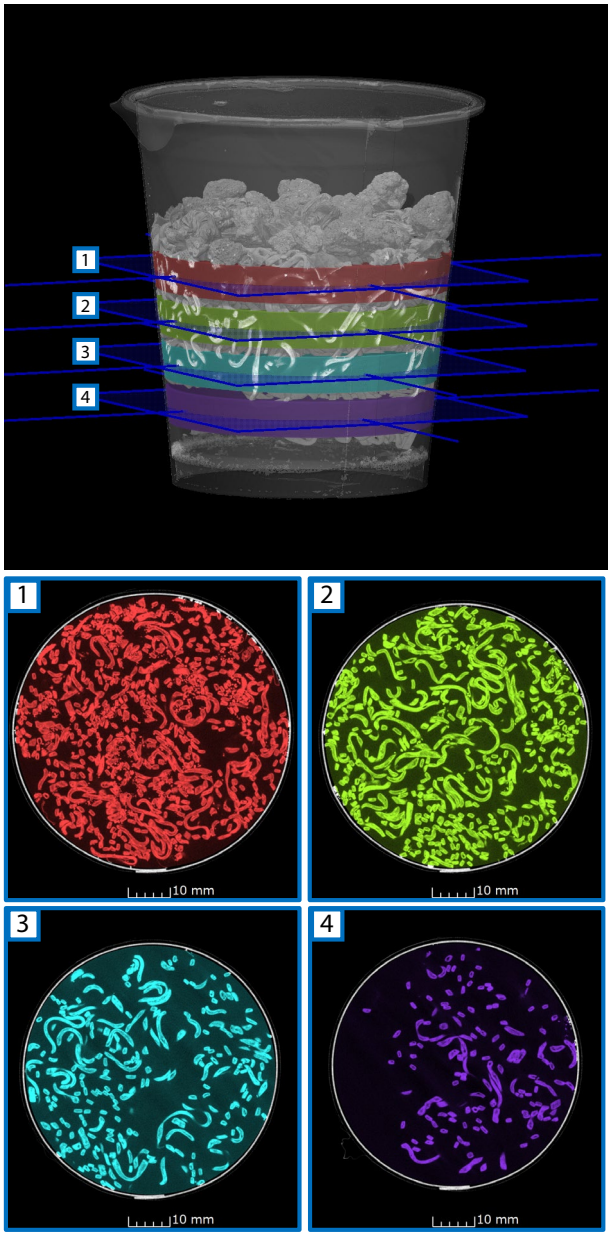

Fig. 4 Colored Sectional image and three-dimensional representation of the instant noodles

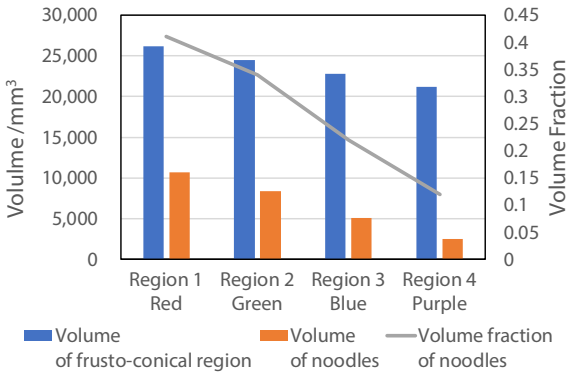

Fig. 5 Volume fraction of noodles

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