Fluorescent balls reveal food structure

PHOTO: SHUTTERSTOCK.COM

Researchers in the Biophysics group have developed a method that identifies the structure of foodstuffs at the molecular level by using tiny fluorescent balls.

These structures play a crucial role in the release of flavours. The researchers published their findings in the scientific journal *Langmuir*. Foods contain thin, long chains of, for example, glucose or proteins. If these chains form an open network, the flavour is released rapidly, whereas a more dense network retains the flavour. 'In the ideal situation, a foodstuff consists of a combination of structures,' says Koen Martens, PhD candidate and lead author of the article. A network of long, open chains combined with dense areas ensures a constant, slow release of flavours, which makes the taste experience last longer.

PING-PONG BALLS

Despite the importance of these structures, there was no good method for identifying the complex organization of the structures until now. So Martens and his colleagues developed a method that uses tiny fluorescent spheres. The movement of the tiny balls reveals how the chains are organized. 'You could compare the system to fluorescent ping-pong balls in a tank of water in a dark room,' Martens says.
The balls move through the water freely. But if you add obstacles to the tank, they can no longer move in random directions. If you study the fluorescent ping-pong balls for a while, this will show you exactly where the balls can move, and consequently where the obstacles are. This is precisely how Martens' method works, only on a much smaller scale: with 30-nanometre 'ping-pong balls' weaving through an obstacle course of long chains.

DO-IT-YOURSELF MICROSCOPE

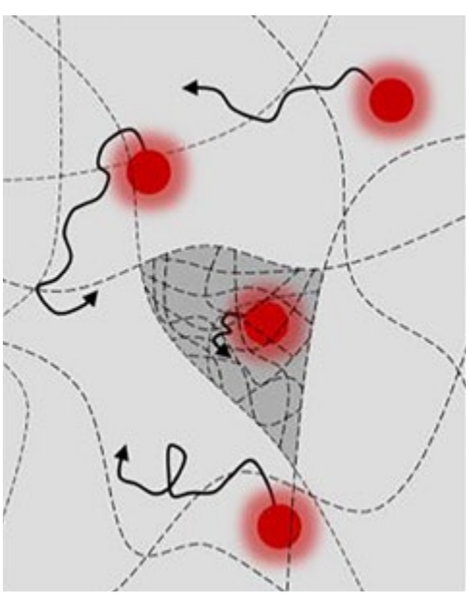
'For us to see these spheres and make the organization of the structures visible, we needed an extremely sensitive microscope with a powerful laser,' Martens explains. 'We didn't have such a microscope and it would cost half a million euros to buy'. To economize, the PhD candidate built his own microscope, using aluminium blocks and 3D printed parts.

The PhD candidate built the microscope (which would cost half a million euros new) himself

Using that microscope, the researchers applied the method to the thickening agent carrageenan, a food additive containing long sugar chains. They observed that the sugar chains in the thickening agent were tightly packed in some places, and further apart in other places. Thus they proved that the method is able to identify different chain structures, something that was hitherto impossible.

MEAT SUBSTITUTES

This newly developed method will allow scientists to study the structure of more complex foodstuffs, such as meat substitutes. Meat contains long protein chains, all facing in the same direction. 'To make plant-based meat substitutes appear as meat-like as possible, their protein chains should be similarly arranged,' Martens explains. This new method can provide new insights and could bring us one step closer to 'plant-based meat'. **NvtWH**



▲ The fluorescent balls move more freely in open structures (light grey) than in denser areas (dark grey).

The VLAG Graduate School funded the study by Martens and his colleagues.