

Scope

Starch is one of the major base of food colloids. Due to differences in starch sources and processing as well as due to seasonal variability it is difficult to standardize starch raw materials. Further starch materials and flours are very complex due to variable content in amylose, amylopectin, gluten and additional components.

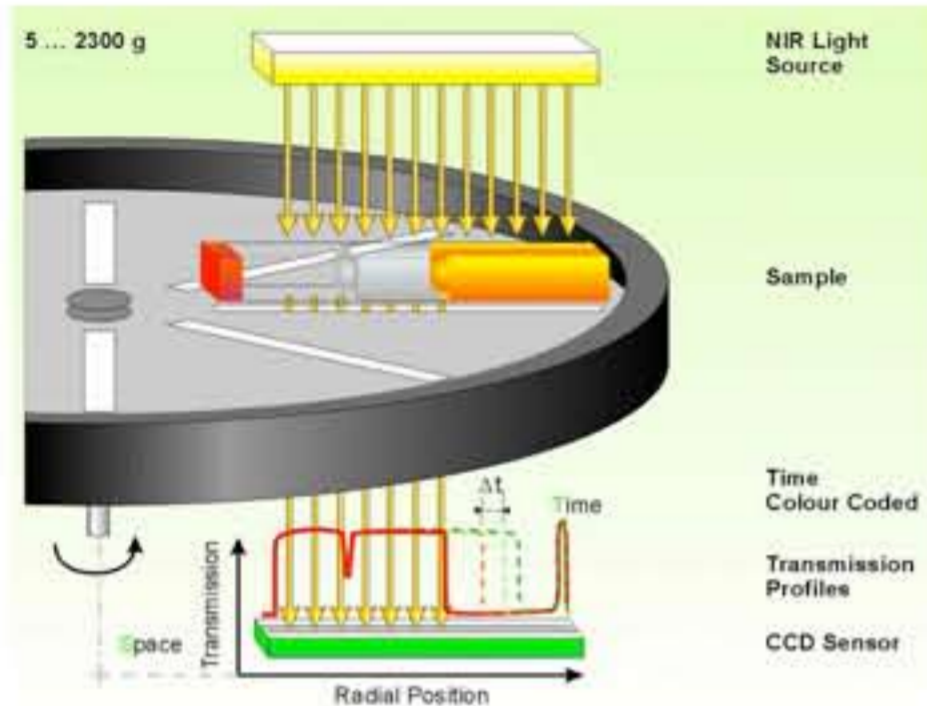
It will be attempted to characterize starches of different origin and flours by measurement of sedimentation, packing and compressional behaviour in centrifugal field using multisample analytical centrifugation with high resolution photometric detection (STEP-Technology).

Experimental

Wheat and potato starch and four different flours (wheat, spelt, rye and cake flour) were obtained from local supermarkets.

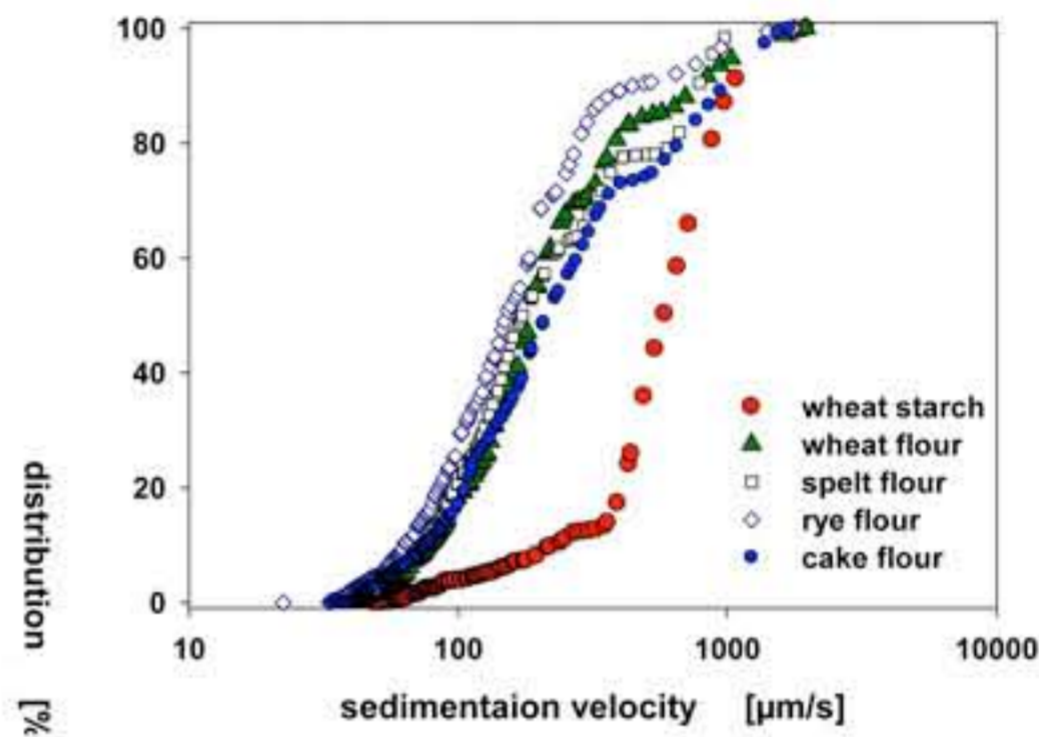
The materials (16 % m/m) were dispersed in deionised water on a laboratory shaker over the weekend and then measured with a multisample analytical centrifuge (LUMiSizer – LUM, Germany) at different centrifugal accelerations (13 - 2300 g).

Method of analytical centrifugation



Local changes are detected during centrifugation. The distribution of transmission is recorded over the whole sample length at predefined time intervals.

Velocity distributions

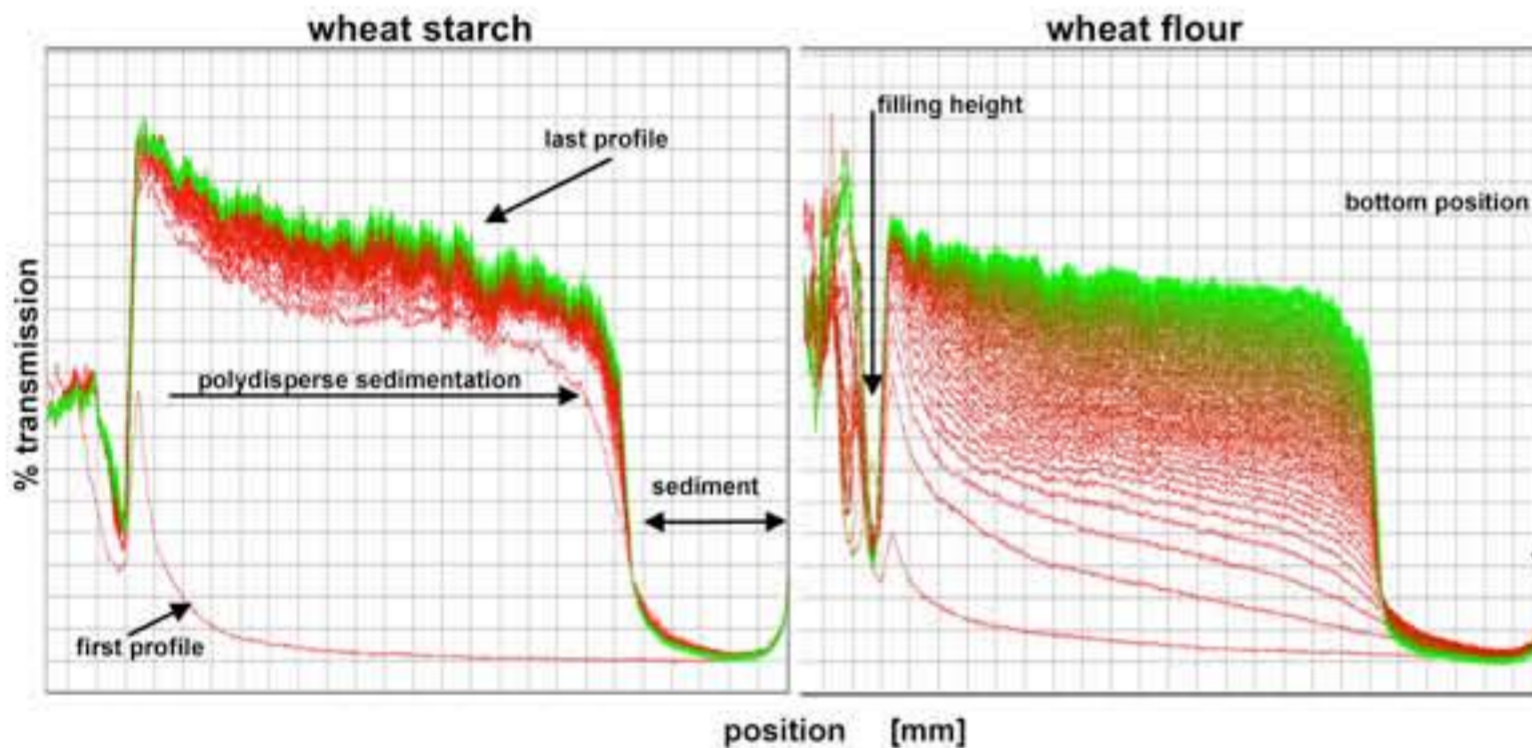


The method allows to characterize and quantify the demixing behaviour, the separation kinetics, the packing behaviour and the particle size or velocity distribution.

The velocity distributions are an integral measure of the differences in size and density (swelling degree)

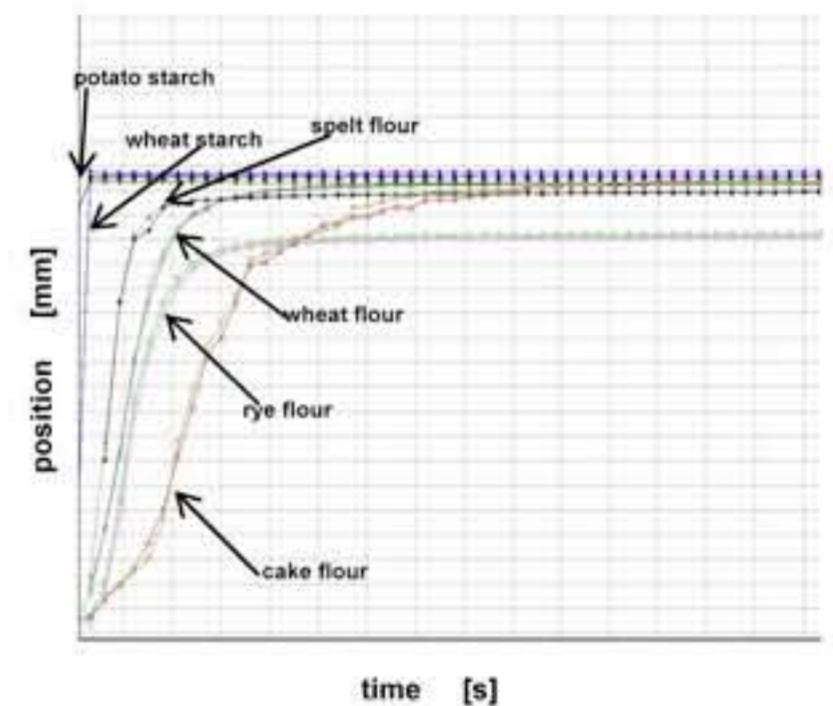
All samples exhibit a bimodal characteristic – a coarse and a fine fraction. The flour samples have a considerably higher content of slowly sedimenting particles.

principle demixing behaviour



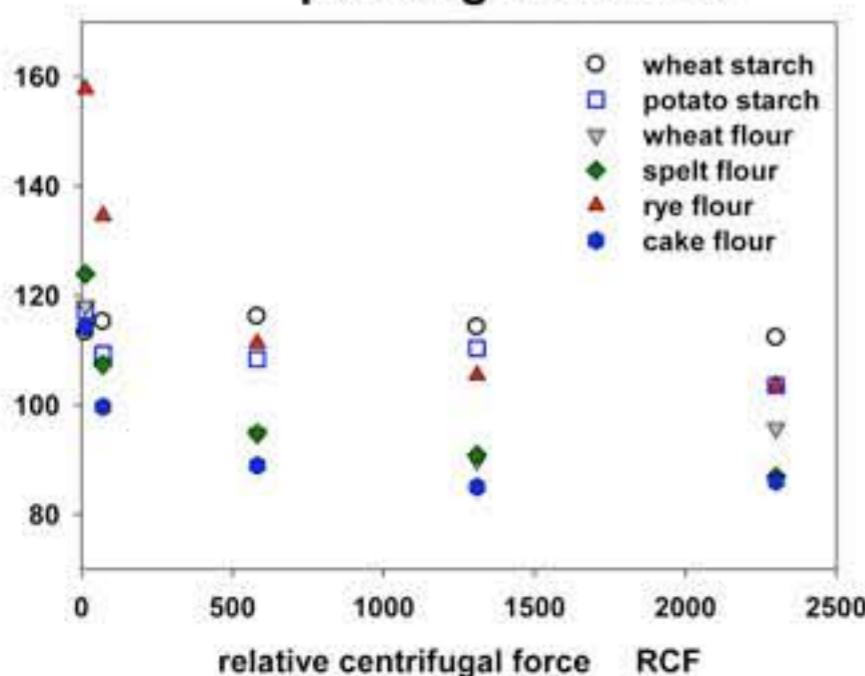
The demixing behaviour is characterized by a polydisperse sedimentation, with the starches sedimenting far more faster.

sedimentation kinetics



There are large differences in sedimentation kinetics with potato starch exhibiting the highest and cake flour the smallest velocity.

packing behaviour



The samples differ in sediment volumes.

The two starches exhibit incompressible sediments.

The flours have a marked compressibility.

Conclusion

- The sedimentation and packing behaviour of starches and flours of different origin was evaluated by multisample analytical centrifugation.
- The samples exhibit a bimodal distribution (coarse and fine fraction) with the flours having a considerably higher fraction of slowly sedimenting particles.
- There are large differences in sedimentation kinetics and the final sediment volumes. The starches exhibit incompressible sediments, while the flours have a marked compressibility.