Structure related rheology of food and biopolymers systems

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Structure related rheology play an important role for the understanding of product properties. First, we need a basic understanding of the material under consideration. From a structural point of view this is complicated as we have to cover a broad range of length scales, starting from the molecular level of the biopolymer characteristics to the behavior in a multiphase system and further implications on the macro scale. This means that knowledge is required from the nanometers to millimeters and a combinations of microscopy techniques are needed.

In many cases information about the microstructure can help us to understand the rheological behaviour of a product. With regard to the rheology, it is important to consider both the strength and rheology during structure formation as well as the failure properties. This is especially important for food and consumption products, where the breakdown performance will determine whether we like product or not. From a fundamental point of view, micro rheology in combination with microscopy can reveal how structure respond to stress concentrations as well a crack propagation in initial stages of break down.

In a real situation the properties of a product are determined by the process and to follow ant control the rheology is crucial in order to obtain products with the desired properties. In precision engineering the rheology can be tuned in unit operations, providing there is a proper understanding of the process-structure rheology relationships. Finally, the dynamics of complex systems are important. Structure as well as rheology have a bearing on mass transport properties such as diffusion of water as well as active components. New microscopy approaches, scattering techniques and the potential to handle big data sets open up new possibilities to increase our understanding of complex structure-rheology relationships.