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Mesoscale simulation of soft condensed matter as foods with Lattice Boltzmann

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Soft condensed matter (SCM) is quite a novel branch of physics, generating a wealth of knowledge that will help food scientists construct the rational design of complex food materials for new food products. SCM is a complex fluid consisting of mesoscopic structures dispersed in a liquid.
The last years food scientists have recognized the potential of SCM to create, and facilitate, new food structures and processes (Mezzenga, 2005). Important progress in SCM is made by mesoscopic simulation methods, which are able to solve the evolution of the mesoscopic structures via hydrodynamics. Five years ago we have recognized the potential of mesoscopic simulation methods, and have applied it successfully in several research projects on food structuring.
In our research we have applied the mesoscopic method named Lattice Boltzmann, to 1) emulsion droplet formation in microfluidic devices (van der Graaf 2006, van der Sman 2006), and 2) microfiltration and fractionation of dairy suspensions with microfluidic devices (i.e. microsieve) (Kromkamp,2005a & 2006) (Brans, 2006). Simulation results as compared with experimental data will be presented. With respect to microfiltration the coupling to macroscopic model will be discussed (Kromkamp, 2005b). The macroscopic model is also implemented in Lattice Boltzmann. This provides a more general view how to build a multiscale modeling approach for modeling processing of soft condensed matter as foods.
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