BP 15: Posters - Complex Fluids and Soft Matter

Time: Monday 17:30–19:30 Location: Poster C

BP 15.1 Mon 17:30 Poster C

Margination of rigid spheres in a partially constricted cylinder — •Christian Bächer and Stephan Gekle — Biofluid Simulation and Modeling, University of Bayreuth, Germany

Previous simulations and experiments have shown the "margination" of rigid spheres suspended in red blood cells flowing through a microchannel: the rigid spheres are pushed towards the wall, whereas the red blood cells concentrate in the inner region of the channel.

To investigate the influence of more complex geometries we simulate margination in a partially constricted cylinder using the Lattice Boltzmann method. This is done using different cylinder lengths and constriction-cylinder ratios. Besides changes in the radial distribution due to the constriction, the density of spheres in flow direction is investigated.

Understanding the influence of a constriction on margination is necessary for efficient drug delivery, especially, in the case of a stenosis.

BP 15.2 Mon 17:30 Poster C

Platelet orientation in laminar flow with no-slip and free-slip boundary conditions — •Lukas Schrack and Stephan Gekle — Biofluid Simulation and Modeling, University of Bayreuth, Germany

We investigate the orientation of platelet-shaped colloidal particles for a pressure driven laminar flow using Lattice Boltzmann method. The alignment is measured by the Hermans orientation parameter. The radial orientation distribution of platelets within a cylinder and a liquid jet is studied. The liquid jet is simulated by a free moving fluid with variable diameter.

We are interested in the influence of no-slip and free-slip boundary conditions on the orientation parameter especially within the transition zone between a cylinder and a liquid jet.

Our simulation results are compared with experimental data of sodium hectorite measured by small angle X-ray scattering.

BP 15.3 Mon 17:30 Poster C

Finite Element Analysis of the Substrate Effect in Cylindrical Indentation — •Adrian Fessel and Hans-Günther Döbereiner — Institut für Biophysik, Universität Bremen, Deutschland

Indentation tests play an important role in tissue analysis. Various testing scenarios can be simplified to a deformable layer resting on a rigid foundation with an indenter of some shape exerting a normal force on the material surface. Focusing on the case of a flat-ended cylinder as an indenter, we perform a parametric finite element analysis aided by analytical considerations aiming to distinguish non-linear material behavior from thickness effects present in force-indentation measurements at finite indentation depths.

BP 15.4 Mon 17:30 Poster C

Multicomponent nature affects liquid phase-separation as a function of temperature. — •Omar Adame Arana[1], Christoph A. Weber[1], Andrés F. Diaz Delgadillo[2], Anthony Hyman[2], and Frank Jülicher[1] — [1]Max Planck Institute for the Physics of Complex Systems, Dresden — [2]Max Planck Institute of Molecular Cell Biology and Genetics, Dresden

Temperature variations affect the fertility of many worm-like species. Fertility in these organisms has been shown to be correlated with the existence of liquid-like drops which phase separate from the remaining cytoplasm. To understand how temperature affects demixing of these drops, embryos of a certain worm species are experimentally subjected to temperature quenches. In these experiments it is observed that the difference of concentration inside and outside of droplet material shows several plateaus as temperature is increased; a behaviour not possible in binary fluids. An open question is whether the multicomponent nature of the cytoplasm can account for this behavior.

To this end we describe the interior of the cytoplasm as a multicomponent mixture using a Flory Huggins model. In this model interactions between the components are captured by parameters which exhibit a specific dependence on temperature. Exploring several choices of interaction parameters we compute the phase diagrams using a convex hull construction. Then we analyze the behavior of the tie lines and find that the difference between concentrations inside and outside of droplet material can exhibit several plateaus as observed in experiments.