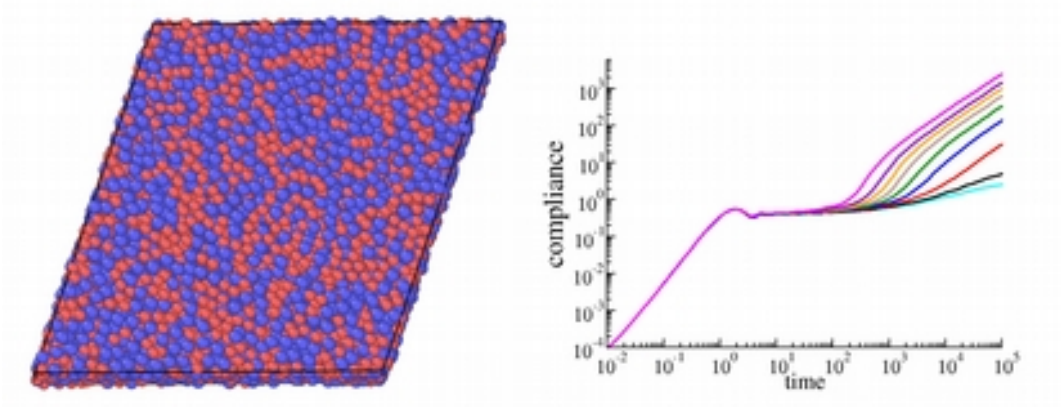
Understanding non-newtonian materials



Motivation

Non-Newtonian fluids are ubiquitous in everyday life, but the understanding of the fundamental physical process underlying their properties still remains a big challenge [1]. Why are we able to walk (yes, you can!) on a pool filled by a mixture of cornstarch and water or why toothpaste behave as a liquid when squeezed or sheared?
Depending on the applied external force, yield stress materials behave solid- or liquid-like, undergoing peculiar transformations in their dynamics with increasing external load.

Your Project

In this project you will study the stress-strain curves for a Yukawa binary colloidal system representing a typical yield-stress material [2]. In particular, the effect of different friction coefficients and damping parameters on the stress-strain curves will be investigated using Molecular Dynamics simulation. The results will help rationalize complex, irreversible phenomena such as aging and creep in disordered system.

Requirements

Background in Soft matter physics would be an advantage. We would like a person interested in modeling, simulation and programming able to work independently. Experience with C and/or Python are essentials.

Other aspects

Your study will be supervised by the associate Professor Cabriolu, who has experience in simulating yield-stress materials. Your computational work will also be supported by Prof. Eiser, whose expertise includes colloidal physics, and in particular on corn-starch [3].

Contact persons

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[1] D. Bonn and M. M. Denn , *Science*, **324** , 1401 —1402 (2009).
[2] R. Cabriolu, J. Horbach, P. Chaudhuri and K. Martens, Soft Matter, **15**, 415-423, (2019).
[3]C. Ness, Z. Xing, E. Eiser, Soft Matter **13**, 3664 – 3674 (2017).