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Complex fluids at the solid-liquid interface

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Complex fluids display a non-monotonic rheological response and internal mesoscopic structure. The latter is often the key for understanding the macroscopic behavior over many length scales ranging from nanometers to millimeters. In this lecture we focus on membrane containing systems, that are systems with stable two-dimensional objects dispersed in the volume. There can be lipid bilayer systems and microemulsions with the two domains of oil and water that are separated by a surfactant film. Later we will see that clay particle dispersions also often form membranes.

Those systems are studied at the solid-liquid interface in terms of structure and dynamics. At the interface the degree of order can be higher. Also the dynamics might be changed in concert with the structure. Modeling those observations gives already good insight to the mechanisms in the system. For some systems, the macroscopic rheology is investigated and connected to the mesoscopic structure. For other systems, already the nano-second time scale displays the interesting visco-elasticity. All observations are connected by models and rationalized to obtain conclusions about the complexity of the rheology in context of the structure.

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