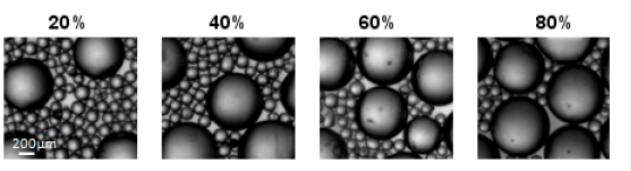
Institut für Strömungslehre und Wärmeübertragung

Bachelorarbeit / Bachelor Thesis

Rafts of anisotropic particles

The interest for microparticles at fluid interfaces has considerably been increasing in the last decades. Indeed, once adsorbed at such interfaces, they allow for their stabilization resulting for example in Pickering emulsions or super stable foams. These complex multiphase assemblies open themselves routes to fabricate new materials with better controlled properties. To cite only one: light and regular solid foam with fire retardation properties for the aeronautic industry. It has also been proposed to use such particles to coat droplets forming “liquid marbles” which are isolated from the solid they lay on but leave gases exchanges possible making them could candidates for innovative sensors or microreactors.

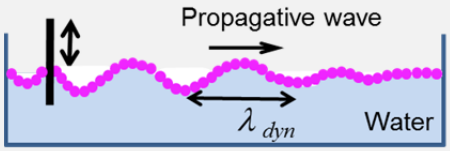
Despite the huge applicability of such interfaces, the knowledge of their mechanical properties remains very poor. So far, studies have mainly been limited to monodisperse microbeads. One recent study of our group addressed the bidisperse cases [1] but non-spherical particles have not been investigated. The purpose of this project is to transpose the method used on bidisperse particle mixtures and which consists in the study of capillary wave propagation in the raft to non-spherical particles.

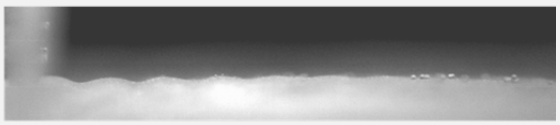


Left: top views (photographs) of particle rafts made of mixtures of hydrophobic microbeads. Two particle sizes are considered and the ratio of small/large particles is varied.

From [1], Physical Review E (2016), Petit et al

Bottom: Sketch and picture of the mechanical forcing used in [1] to study the propagation of capillary waves on particle rafts.





Tasks

- Preparation of hydrophobic cylindrical particles with various aspect ratio (length/diameter)
- Built-up of a mechanical forcing device using a shaker (in house) to study capillary wave propagation
- Recording the capillary wave propagation (movies) on rafts on anisotropic particles
- Data treatment (image analysis) to obtain the celerity of the waves in the plan of the rafts for various forcing frequencies (dispersion relation)
- Writing the corresponding scientific documentation.

We offer

- A scientific supervision of high quality
- An international and dynamic work atmosphere
- Access to all the required facilities of the Institute

The bachelor project will be accomplished at the Institute of Fluid Mechanics and Heat Transfer (Institut für Strömungslehre und Wärmeübertragung). The project can start any time. If interested, please contact Dr. Carole Planchette, Tel. 0316 873-7357, Email carole.planchette@tugraz.at