OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
VST FAKULTÄT FÜR VERFAHRENS- UND SYSTEMTECHNIK

THERMODYNAMIK
Lehrstuhl für Strömungsmechanik und Strömungstechnik

Modeling water droplet contact angle on natural hydrophobic or hydrophilic surfaces

The **lattice Boltzmann** method has been shown to be an efficient simulation tool for multi-phase systems. The so-called **pseudo-potential** lattice Boltzmann formulation has become one of the most widely used approaches to model liquid/gas systems [1]. This popularity is mainly due to the simplicity of the algorithm and its computational efficiency. Such a solver has been recently added to our in-house modeling tool **ALBORZ**, allowing for large density and viscosity ratios (suitable for water/air systems). The aim of this project would be to first **validate** the available implementation, and then use it to model and measure the **static contact angles** of a water droplet on hydrophobic/philic surfaces found in nature such as: Lotus (Nelumbo Nucifera), Ginkgo Biloba, Thalia Dealbata leaves. Based on the understanding acquired through the previous step, biomimetic (double heterogeneous) hydrophobic/philic textured surfaces can be designed via parametric simulation studies.

The Validation step will consist of first ploting the co-existence curves at different temperatures for different equations of states using the Maxwell equal-area reconstruction (for the reference data). Then of validating fluid-solid interaction by measuring (and validating) contact angles for smooth surfaces.

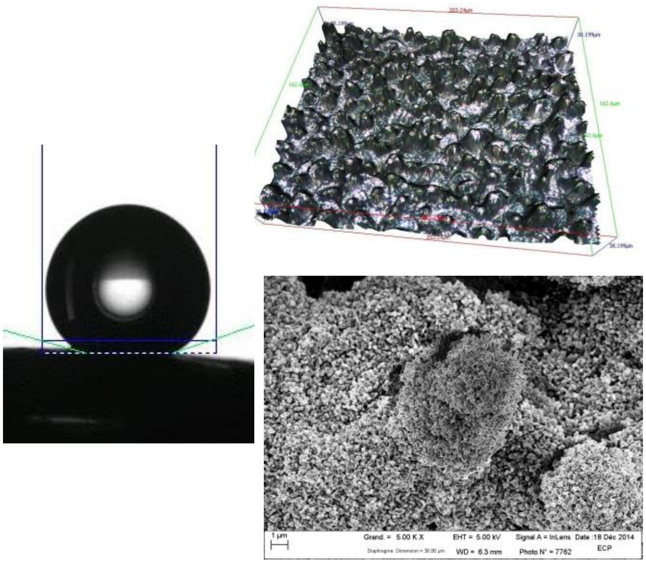

Figure 1: (top) optical micrograph (bottom left) contact angle and (bottom right) SEM -scanning electron microscope- image of a lotus leaf surface.

[1] C. Li, Q. Kang, Y. Mu, Y-.L. He, W-.Q. Tao **A critical review of the pseudopotential multiphase lattice Boltzmann model: Methods and applications.** International journal of heat and mass transfer 76 (2014): 210-236.

Skills:

- Coding experience in C++ (basic understanding of object-oriented coding would be a plus)
- Excellent fluid mechanics background
- Excellent English and communication skills
- Curiosity and willingness to learn and study new concepts
- Motivation to carry out independent scientific work

Supervision:

Seyed Ali Hosseini, Dr. (seyed.hosseini@ovgu.de)

Dominique Thévenin, Prof. Dr. (thevenin@ovgu.de)

Start: As soon as possible **End:** max. five months after start of the project