Karlsruhe Institute of Technology

Institute of Fluid Mechanics
Building 10.23, Kaiserstraße 10, D-76131 Karlsruhe
http://www.istm.kit.edu

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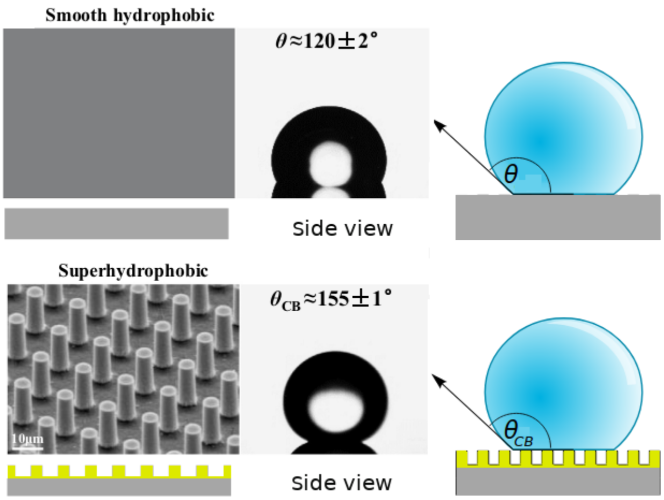
Master-Thesis – numerical

Direct numerical simulation of heat transfer during drop impingement

Drop impact on heated surface has wide application in spray cooling systems (e.g for cooling Li-ion batteries in electric vehicles). The wetting dynamics of droplet after impact determines the system performance. While the main characteristic of the process is the non-dimensional number is Weber number (We), the surface topology plays an even more important role in the eventual outcome of drop impact – deposition, rebound or splash. The hydrophobicity is defined as tendency of droplet to repel from surface after impact. The surface wetting ability is characterized with equilibrium contact angle (θ_e), e.g. on hydrophobic surfaces ($\theta_e > 90$) the drop tends to rebound after impact. Higher level of hydrophobicity ($\theta_e > 120$) can be usually manufactured with a micro/nano-texture layer on a smooth hydrophobic surface. This thin texture layer alters heat transfer mechanism. In this study, the drop impact on a resolved microstructured surface will be simulated to evaluate the cooling effectiveness directly. This study helps to design the fabricated surfaces with manageable heat transfer capability. The simulation will be performed with *phaseFieldFoam* solver in the open-source toolbox OpenFOAM.



Requirements:
Basic knowledge computational fluid dynamic

Beneficial Skills:
OpenFOAM and python

Start: immediately

Contact:
Dr. Nima Samkhaniani
Dr.-Ing. Alexander Stroh

Institute of Fluid Mechanics
Kaiserstraße 10,
Building 10.23, 6th floor,
Room 601

☎ +49 721 608-43528
✉ nima.samkhaniani@kit.edu
✉ alexander.stroh@kit.edu