a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

Supervisor Contact: Prof. Boris Stoeber, Ph.D., P. Eng.
Department of Mechanical Engineering
office: Room 3112 Kaiser Bldg - mail: 2054-6250 Applied Science Lane
The University of British Columbia, Vancouver, B.C. V6T 1Z4, Canada
email: stoeber@mech.ubc.ca, phone 604-827-5907

MECH 493 project: Droplet impact dynamics on inclined substrates

Background and research goal

Droplet impact dynamics on a solid surface is of practical importance in several applications such as spray-cooling of hot surfaces, spray painting and coating, ink-jet printing, microfabrication of structured materials (electric circuits in microelectronics produced by precision solder-drop dispensing), designing self-cleaning and low-drag surfaces. The droplet impact is a transient process that depends on liquid surface tension, viscosity, density, and wettability of the solid substrate. Further, the droplet initial conditions i.e. its diameter, impact velocity and influence of gravity also affect the process notably. So far, the orthogonal impact of a droplet on horizontal substrates has been widely studied. However, the impact of droplet on an inclined substrates is less extensively studied and needs more attention. The droplet impact on horizontal substrates is a symmetrical problem, where after droplet impact during spreading contact line advances and during recoiling contact line recedes, based on this several contact angle models have been developed. However, these contact angle models will not be applicable for a droplet impact/sliding on an inclined substrates. Since, on an inclined surface after the droplet impact, parts of the contact line advance while other parts recede, simultaneously. Thus, the objectives of this study are i) to perform experiments of a droplet impact on various inclined substrates ii) to extend/develop a contact angle model for such a problem.

Tasks to be performed by the student

1) To select, prepare and characterize the fluids.
2) To select, prepare and characterize the substrates.
3) To perform the experiments using high-speed visualization.
4) To observe the advancing angles at the leading edge and receding angles at the trailing edge of the droplets.
5) To analyze the data and develop a contact angle model.

Facilities and team:

All experimental work will be done in PPC 121/308. The student will work closely with Prof. Stoeber's Post-doc research fellow Dr. Nagesh Patil (email: nagesh.patil@ubc.ca phone: 778-325-0879). Nagesh has extensive experience in interfacial droplet dynamics field.