a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

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MECH 493 project: Effect of properties of heated substrates on the deposition of particles from evaporation of droplets

Background and research goal

The evaporation of a water droplet on a solid surface is a commonly observed phenomenon in daily life. When a droplet containing colloidal particles is evaporated on a solid surface a ring-like deposit forms, commonly known as a coffee-ring effect. Over the last two decades, this problem has been a topic of interest due to its potential applications in ink-jet printing, micro-arrays, biosensors and self-assembly of particles. Owing to the technical applications, several studies have found ways to control the spatial distribution of the particle deposits, such as the effect of substrate heating, substrate wettability, addition of surfactant in droplet solution, colloidal particles shape and size, etc. With the current understanding from the literature, it is expected that when a small sessile droplet is allowed to evaporate on the heated substrate, the thermal conductivity of the substrate and its dimensions can have a major effect on the deposition pattern of the suspended particles. Therefore, in the present work, the objective is to study the effect of i) thermal conductivity as well as ii) the substrate geometry of a heated substrate during evaporation of a small sessile droplet containing colloidal particles.

Tasks to be performed by the student

1) To prepare and characterize solutions with colloidal particles.
2) Substrate preparation and its characterization.
3) To perform experiments using confocal microscopy and a high-speed camera.
4) To observe particle deposition patterns.
5) To analyze and explore the evaporation dynamics inside the droplets.

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.