THE SPREADING BEHAVIOUR OF DROPS ON AN AIR-LIQUID INTERFACE

The impact of drops on surfaces finds various industrial applications ranging from ink-jet printing and thermal spraying to deposition of cell-containing drops to fabricate living tissue. The work involves studying the spreading of evaporating drops and suspension drops on an air-liquid interface. Our preliminary experiments show that an ethanol drop spreads initially, and then retracts over the oil phase. During the retraction phase, the ethanol film can become unstable and disintegrate into small droplets. Contrary to this, PMMA suspensions show only the spreading phenomena, and can display an instability during the spreading process.

These fascinating phenomena will be studied more systematically in this project. The experiments will examine the spreading behavior of volatile fluids or PMMA suspensions. For volatile fluids, the effect of experimental parameters such as initial drop size, volatility, fluid viscosities, interfacial tension, etc., will be characterized. For suspensions, the effect of parameters such as the suspension drop size, fluid viscosities, particle size and particle volume fraction, will be examined.

The deliverables for the project include:

1) Setting up a system to measure contact angle of a liquid drop sitting on the interface of a suspending medium using reflected beam/ meshed grid configuration.

2) Setting up the optical system to image the motion of drop in a suspending phase.

3) Conducting experiments for different systems where evaporation does/does not play a role in spreading/contraction for the parameters mentioned above.

4) Conducting experiments for suspensions with the various parameters indicated above.

The project begins in January 2017. For more information, contact Prof. Ramchandran at Arun.Ramchandran@utoronto.ca