

# MAE Seminar SERIES

MONDAY,  
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11:00 AM  
FURNAS 206



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# MULTIPHASE FLOW AND SURFACE SCIENCE

## ABSTRACT

Liquid and droplets interaction with solid substrates have various industrial applications from ink-jet printing to ice accretion on wind turbine blades, power lines and aircrafts. It is known that the incipience of icing phenomenon arises from the shedding and coalescence of the rain droplets. The coalesced droplets then start to form a runback flow and ice can be accumulated on these structures under sub-freezing temperature that alters the performance of the mentioned technologies. In this presentation, I demonstrate how rivulets are formed from merging droplets on a hydrophilic substrate, when the air speed (serves as the driving force) is high enough. In contrast, there is no rivulet formation on a superhydrophobic substrate, and coalesced droplets roll on the surface and detach from it under high speed air flow. In addition, the results indicate a contrast in the mechanism of the coalescence and subsequent detachment between a single and two droplets on a superhydrophobic surface. At low air speeds, two droplets coalesce by attracting each other before detaching with successive rebounds on the substrate. On the other hand, the detachment occurs almost instantly after coalescence at higher speeds, where the detachment time decreases exponentially with the air speed.

Furthermore, this presentation touches a few other topics such as Continuous Feeding of Liquid in Wind Tunnel, Droplet Impact on Solid Substrates, and Liquid Interaction with Porous Medium. Towards the end, I will discuss my future teaching and research plans.

## BIO SKETCH

Dr. Sara Moghtadernejad got her PhD in Mechanical Engineering from Concordia University (Montreal, Canada) in 2014. She completed her M.Sc. in Mechanical Engineering and her B.Sc. in Chemical Engineering from University of Queensland (Brisbane, Australia) and Sharif University of Technology (Iran, Tehran), respectively. Following her PhD, she researched at Biomimetic Surface Engineering lab at McGill University as a post-doctoral Fellow. In 2016, she joined Rutgers University as a postdoc and a lecturer, where she continued her research at NSF Engineering Research Center on Structured Organic Particulate Systems (CSOPS).

Dr. Moghtadernejad's research-interests are centered around:

- Fluid dynamics (Multiphase flow)
- Micro/Nano fluid systems
- Transport phenomena (Suspension & particles, Porous media)
- Heat transfer and Thermodynamics (Thermo fluid, Solidification)
- Pharmaceutical unit operations (Feeder, Blender, Mill, Tablet press)



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