The Petal Effect of Parahydrophobic Surfaces offers Low Receding Contact Angles that Promote Effective Boiling

Faculty: J. A. Weibel, S. V. Garimella **Student: Taylor P. Allred**

Objective

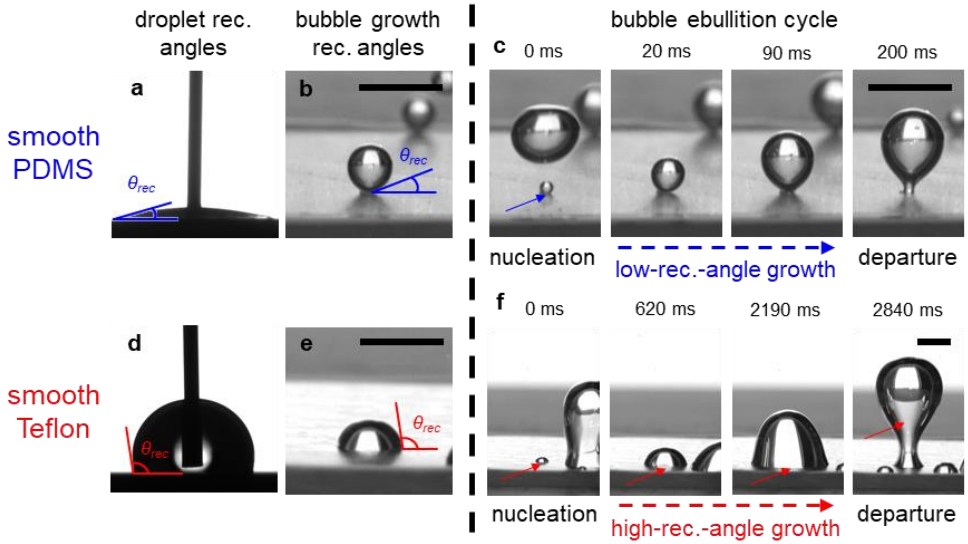
- Evaluate the role of dynamic wetting behavior on bubble dynamics and boiling performance.
- Perform the first boiling study on rose-like para-hydrophobic surfaces.

Approach

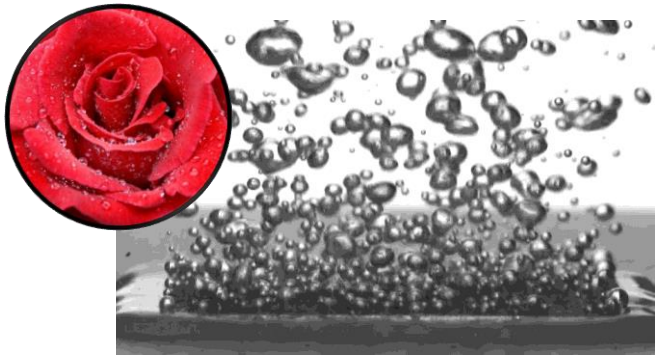
- Fabricated smooth and textured hydrophobic surfaces with high and low receding contact angles.
- Evaluated the bubble dynamics and boiling performance of each surface.

Impact

- Showed that the receding contact angle plays the dominant role in governing bubble growth dynamics and critical heat flux.
- Demonstrated that hydrophobic surfaces can maintain nucleation boiling to high heat fluxes with sufficiently low receding contact angles.
- Introduced the promising class of parahydrophobic surfaces for boiling enhancement.



Receding contact angle measured on a droplet (a,d) and bubble (b,e) and progressive images of the bubble ebullition cycle on low-receding-angle PDMS and high-receding-angle Teflon surfaces.



Effective Nucleate Boiling from a parahydrophobic surface with rose-like wetting behavior.

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