

Droplets on Soft Surfaces Exhibit a Reluctance to Coalesce due to an Intervening Wetting Ridge

Faculty: Justin A. Weibel, Suresh V. Garimella

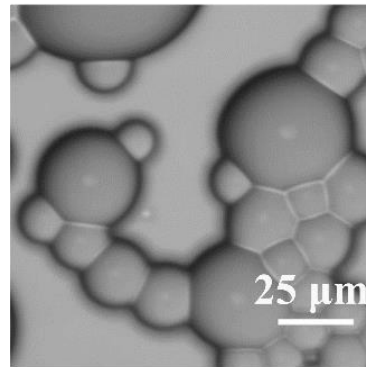
Student: Rishav Roy

OBJECTIVE

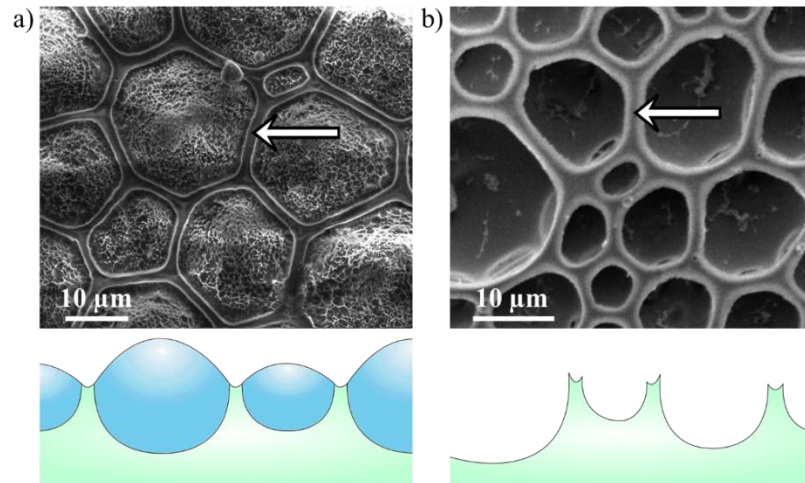
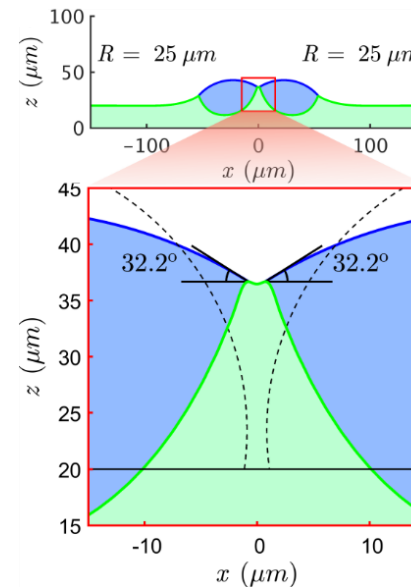
Study the condensation of water droplets on soft surfaces and explain the observed reluctance of droplets to coalesce.

APPROACH

- Condensing water droplets on a soft surface exhibit reluctance to coalesce and assume non-circular footprints due to extreme clustering.
- Cryo-SEMs reveal the presence of intervening wetting ridges between neighboring droplets.
- A linear elastic model predicts the shape of the intervening wetting ridge and reduction of the apparent contact angle.



(Above) Clusters of droplets formed during condensation
(Right) Surface deformation predicted by linear elastic model



(Above) Cryo-SEM images of a) water droplet-clusters on soft polymer and b) the fixed underlying polymer after frozen droplets are detached, with corresponding schematic representations below the images

IMPACT

Understanding droplet-to-droplet interactions on soft surfaces can:

- explain the dynamics of self-assembly, traction force microscopy, etc.; and
- provide guidelines for design and fabrication of substrates with application-specific functionality.

PUBLICATION

Roy, R., Seiler, R. L., Weibel, J. A., Garimella, S. V., Droplets on Soft Surfaces Exhibit a Reluctance to Coalesce due to an Intervening Wetting Ridge. Adv. Mater. Interfaces 2020, 2000731. <https://doi.org/10.1002/admi.202000731>