# Study of Surface Roughness on Wettability of Hydrophilic Surfaces



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#### I. Summary

The effect of surface roughness on the wettability of hydrophilic surfaces was tested. This surface characterization was performed on 3D printed PETG-based samples covered by a layer of cured epoxy resin. Two methods of surface structuring were used and the validity of two theoretical wettability models was studied. Initial results suggested that the Wenzel model was in effect. Further results proved that the study performed here was not enough to completely prove the existence of one model or the other. Further research using more advanced tools is required in the future to obtain conclusive results.

### II. First Observations Cryptoglossa verrucosa was



### III. Wettability Models



studied for its passive thermoregulation,

- High relative humidity = jet black,
- Low relative humidity = blueishwhite.

Wax-secreting tubercles (Left) Creation of the mesh (Right)







## **IV. Sample Preparation**

- Samples were 3D printed,
- A layer of epoxy resin was deposited,
- Two surface structuring



# V. Surface Topography

- Scanning Electron Microscope (SEM) was used,
- Sputter Coater was used to coat samples in gold.



### methods were used: laser engraving and abrasion.

### 3D Sample Model

Samples After Laser Engraving (Left) Samples After Abrasion (Right





Laser Engraving Sample (Left) Abrasion Sample (Right)

### VI. Wettability



### VII. Roughness



#### VIII. References

- [1] Neil F. Hadley. Wax secretion and color phases of the desert tenebrionid beetle cryptoglossa verrucosa (leconte). *Science*, 203(4378):367-369,1979
- [2] Germano Enzo. Bâtiments Thermorégulés Inspirés du Vivant. (unpublished), June-October 2021
- [3] Zen Yoshimitsu et al. Effects of surface structure on the hydrophobicity and sliding behavior of water droplets. *Langmuir*, 18(15):5818-5822, 2022

