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From drop impact to fog harvesting using hydrophobic meshes

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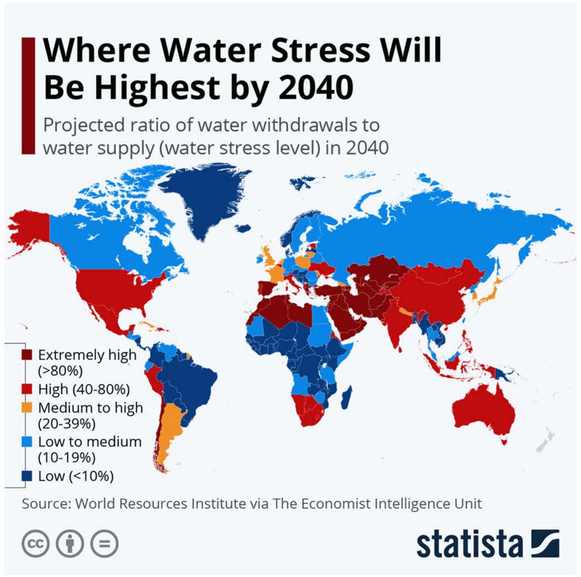
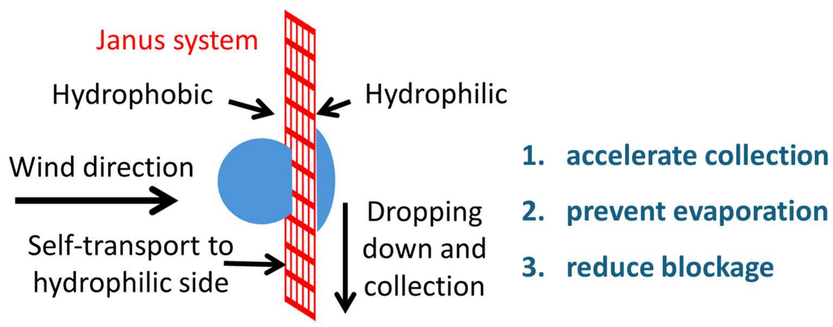
Introduction



WaterHaB: Engineering bio-inspired atmospheric Water Harvesters through fog collection with Badgir architecture



1. accelerate collection
2. prevent evaporation
3. reduce blockage

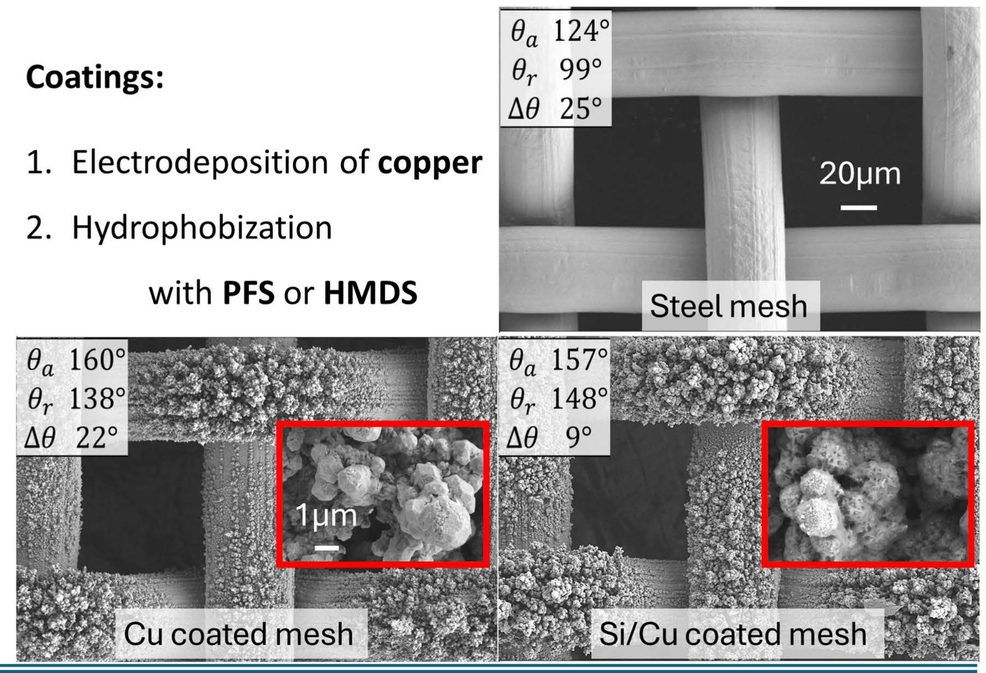
Issues:
(i) re-entrainment of collected droplets into the prevalent wind
(ii) mesh opening blockage

Sample preparation

Substrate: stainless steel mesh

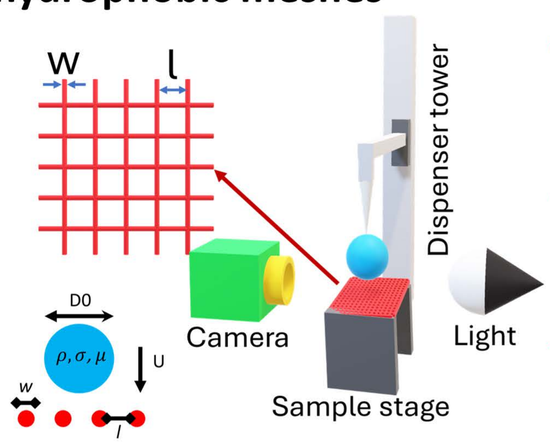
Coatings:

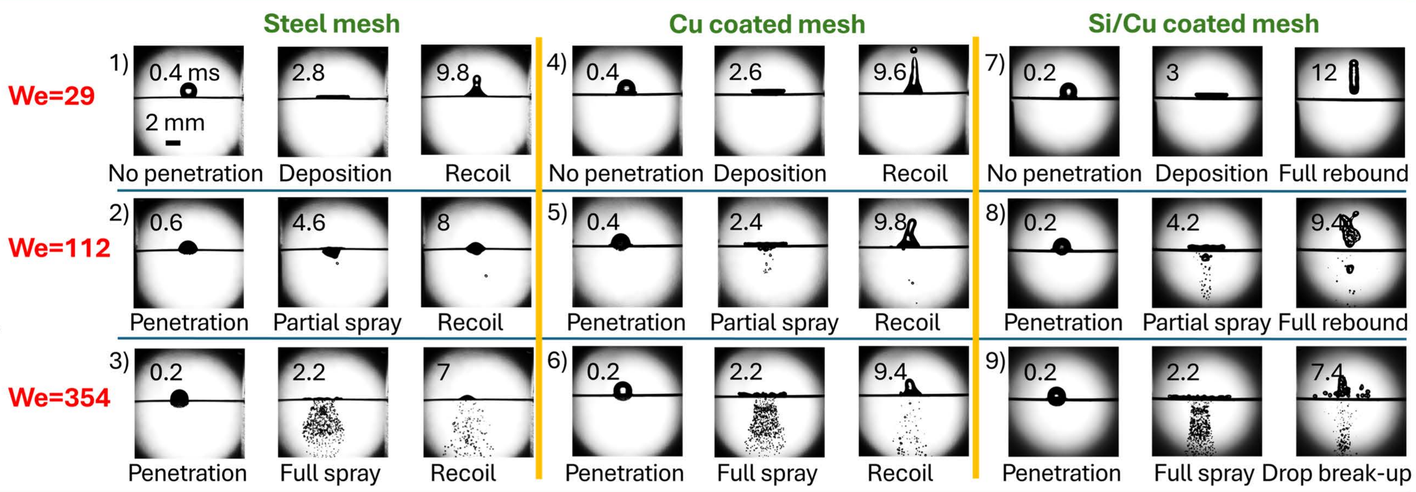
1. Electrodeposition of **copper**
2. Hydrophobization with **PFS** or **HMDS**



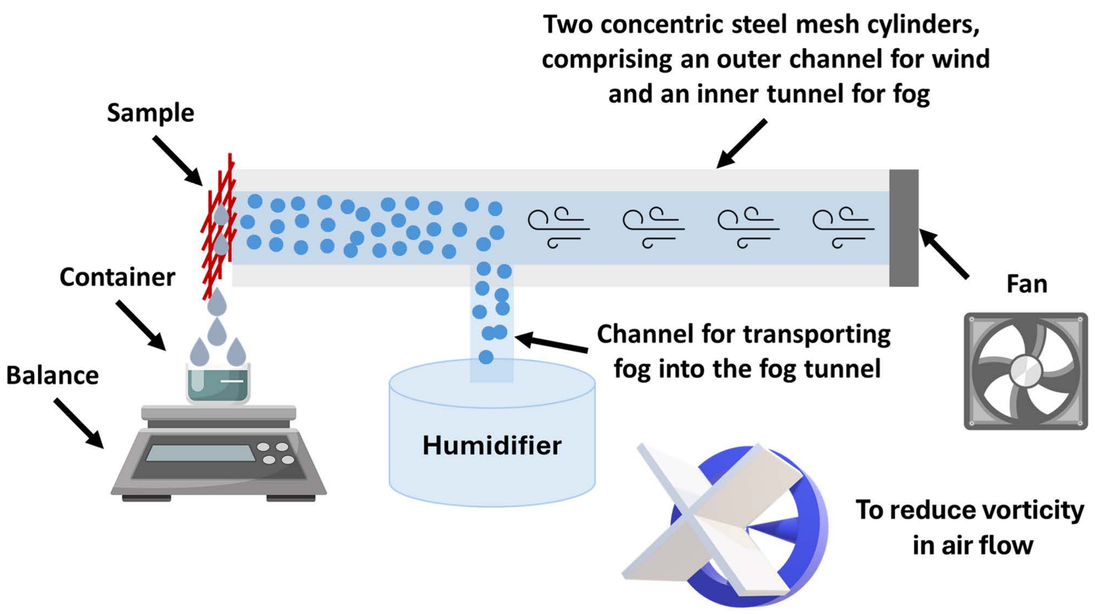
Drop impact outcomes on hydrophobic meshes

Droplet volume (μl)	5.7
Droplet diameter (mm)	2.06
Initial drop velocity (m/s)	[0.4, 3.7]
We= $\rho D_0 U^2/\sigma$	[5, 292]
Image resolution ($\mu m/px$)	20
Frame rate ($frame/s$)	5000

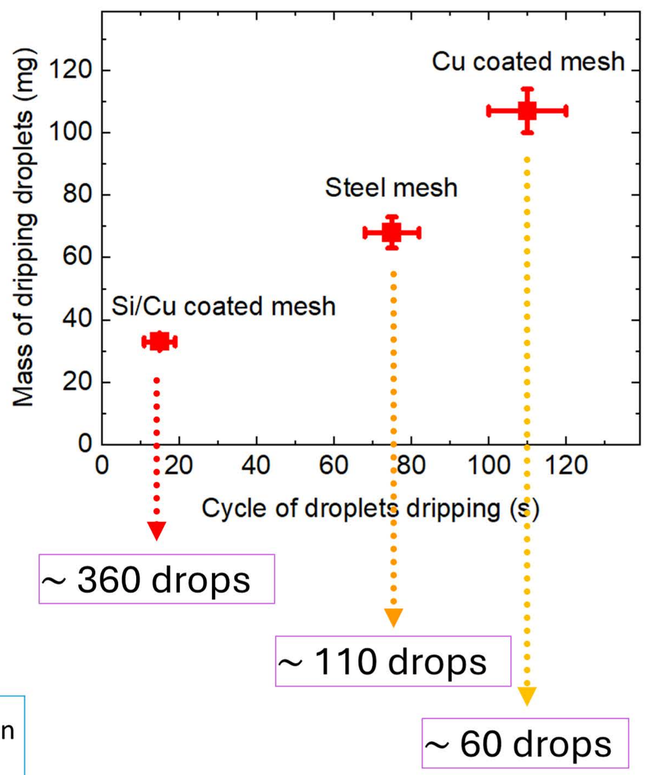


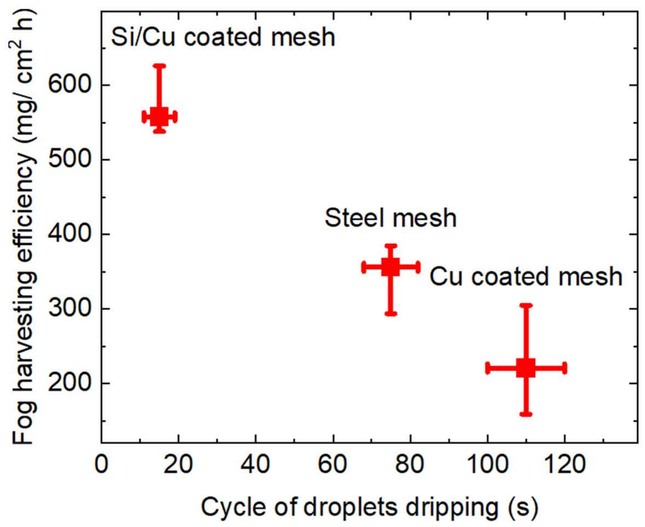


Water harvesting through hydrophobic meshes



Fog flow rate (ml/h)	Wind speed (cm/s)	Fog droplet size (μm)	Temperature (°C)	Humidity (%)	Mesh surface area (cm^2)	Test duration (hours)
210	30	< 20	33 ± 3	26 ± 6	3×3	2





$$\text{Fog harvesting efficiency} = \frac{\text{amount of collected water}}{\text{test duration} \times \text{mesh surface area}}$$

40% higher water collection efficiency comparing to steel mesh

References:

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