

Superhydrophobic Leaf Mesh Modified by SiO₂ Nanoparticle – Polystyrene Nanocomposite for Oil–Water Separation

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Key Issues faced Worldwide

Oceanic Oil spill



Industrial Oil spill



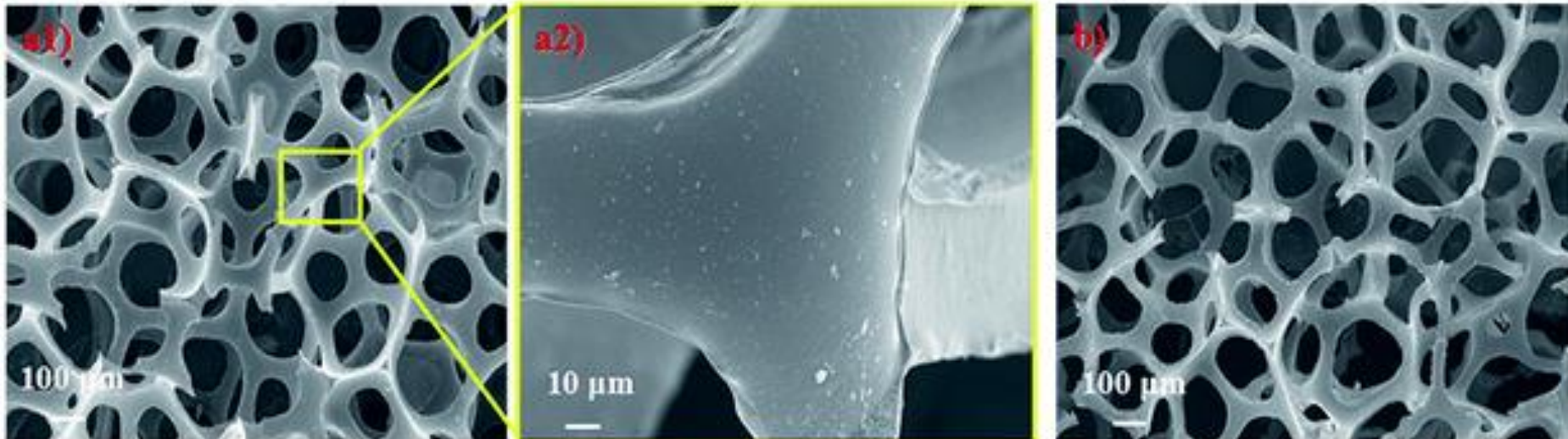
Oil Pollution around the World

Effect on Environment

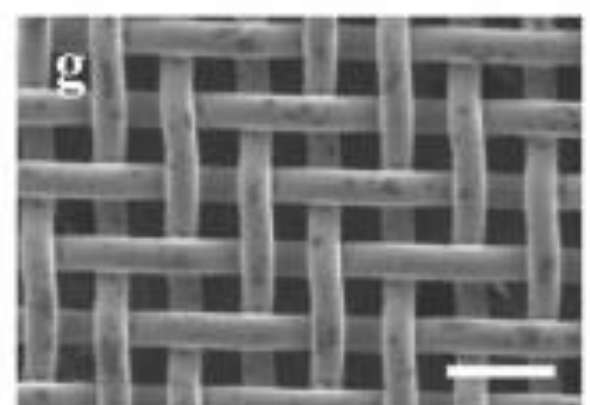
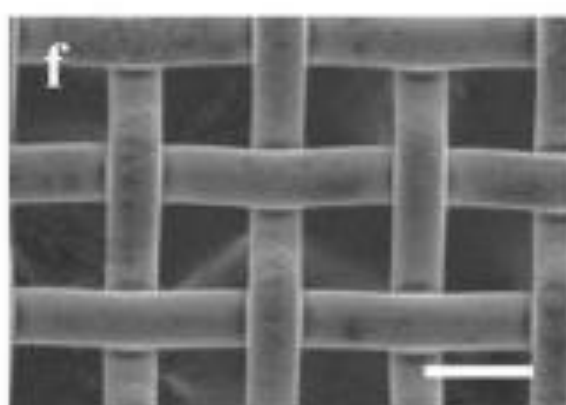
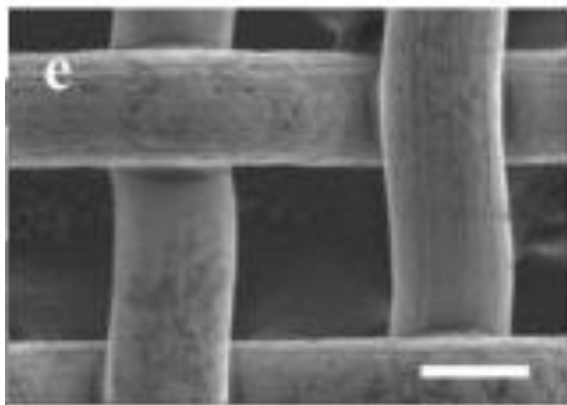
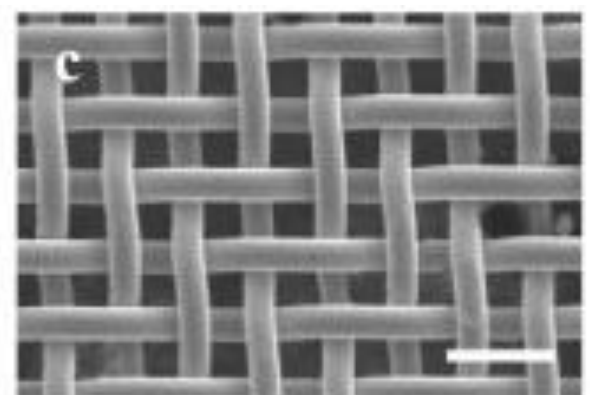
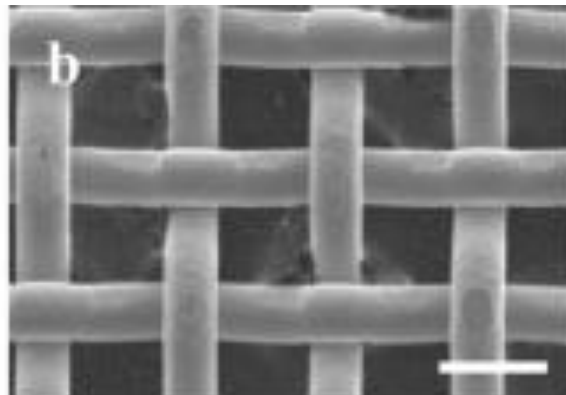
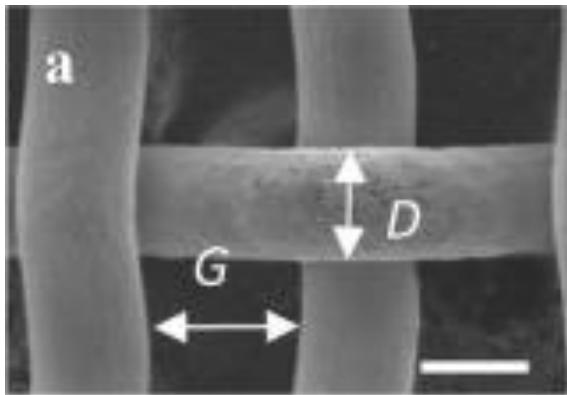
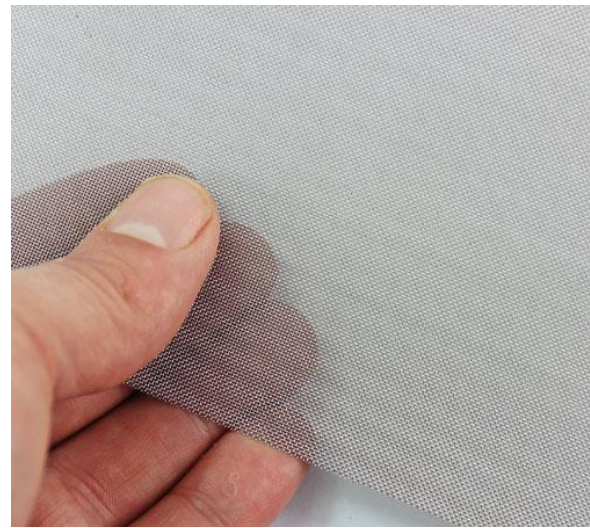


Superhydrophobic Surface modification of Sponges or Meshes for efficient Oil – water Separation Applications

Polyurethane Sponges



Stainless Steel Mesh



**Superhydrophobic Leaf Mesh Modified by SiO₂ Nanoparticle –
Polystyrene Nanocomposite for Oil–Water Separation**

Teak Wood Tree



Teak Wood Leaf Mesh for Oil – Water Separation



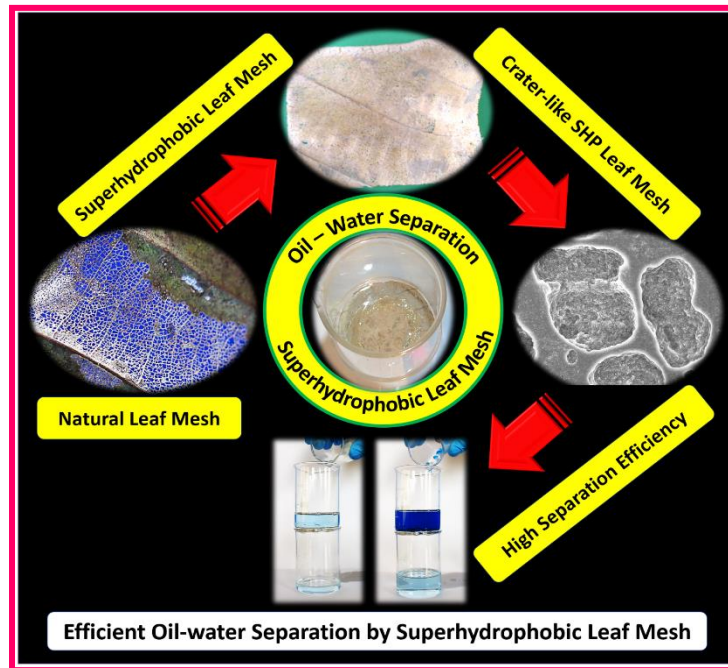
Green Leaf



Dried Leaf Mesh

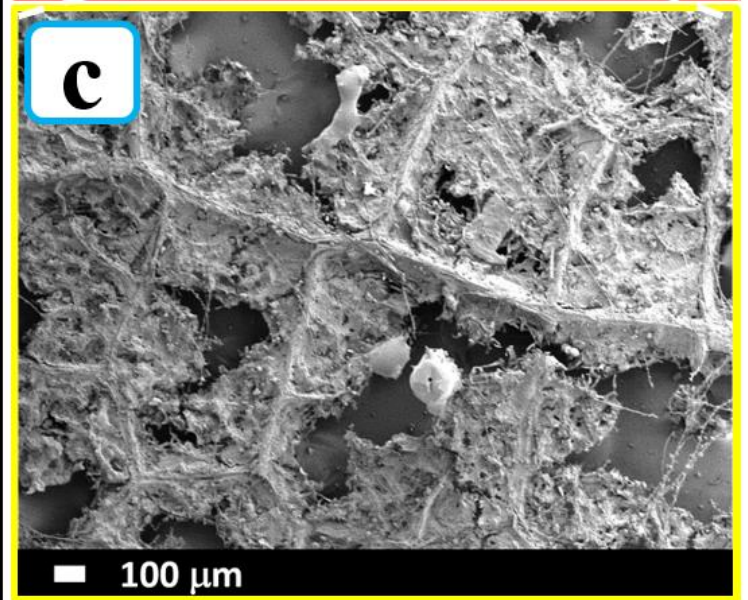
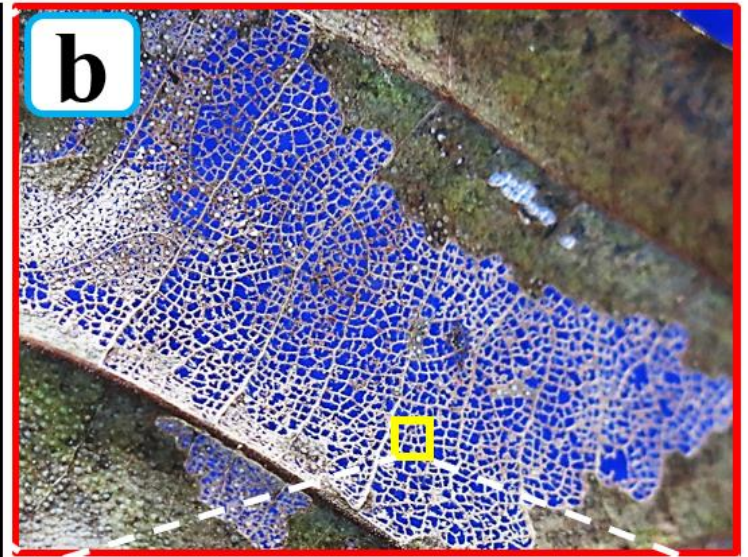
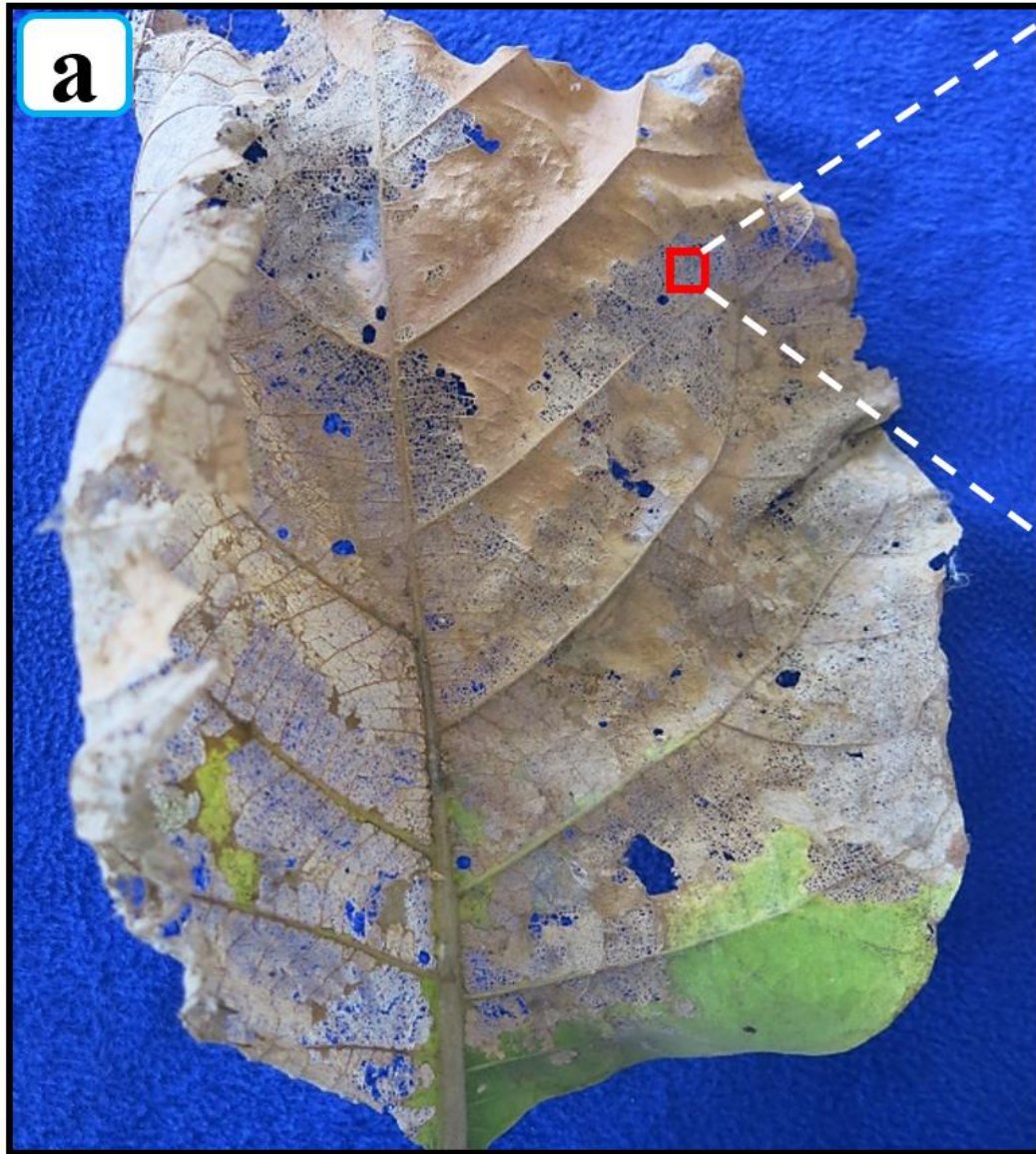
Abstract of Research Work

- We present a novel and simple approach to fabricate superhydrophobic leaf mesh for oil-water separation.
- Nanocomposite of SiO_2 and polystyrene (SiO_2 -PS) deposited on a naturally dried *Tectona Grandis* leaf mesh showed an excellent superhydrophobic and superoleophilic properties.



- Superhydrophobic leaf mesh exhibited fast separation of oils like petrol, kerosene, diesel, coconut oil from oil-water mixtures with separation efficiency greater than 95%, which lasts for more than 18 separation cycles.
- The prepared material can be used efficiently for the oil-water mixture separation for any oil with absolute viscosity less than 55 centipoise (cP).

Morphology of Teak Wood Leaf Mesh



Optical Images

Dried Leaf Mesh

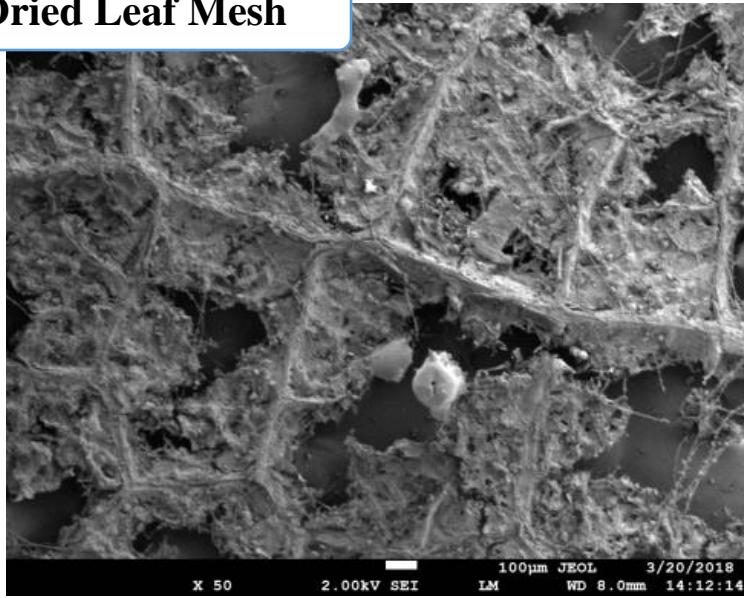


Si NPs – PS Modified Leaf Mesh

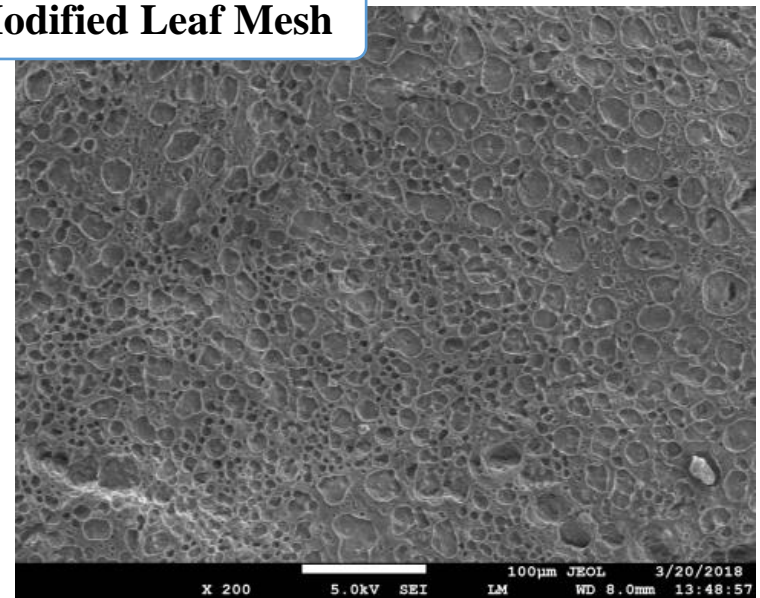


Morphological Studies (SEM)

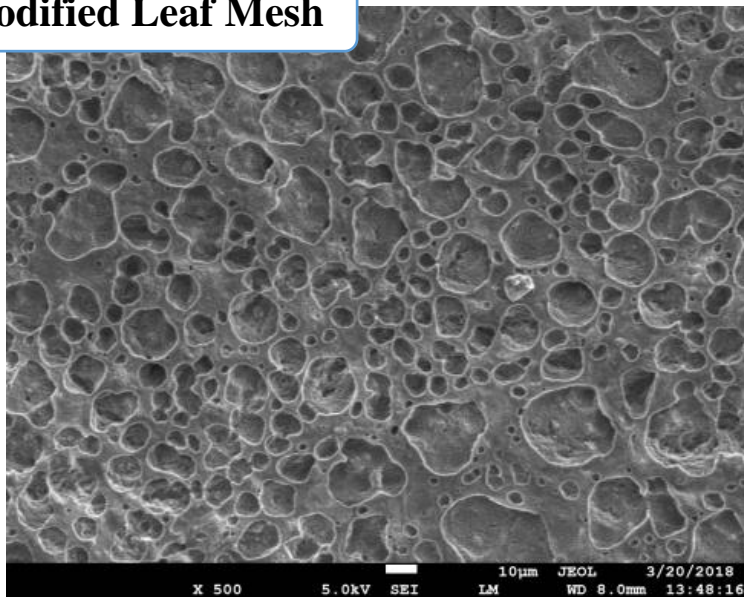
Dried Leaf Mesh



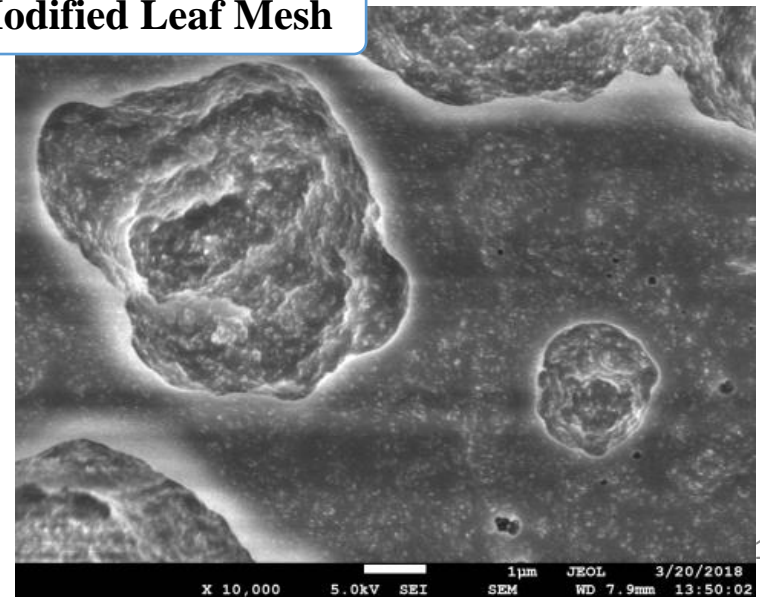
Modified Leaf Mesh



Modified Leaf Mesh



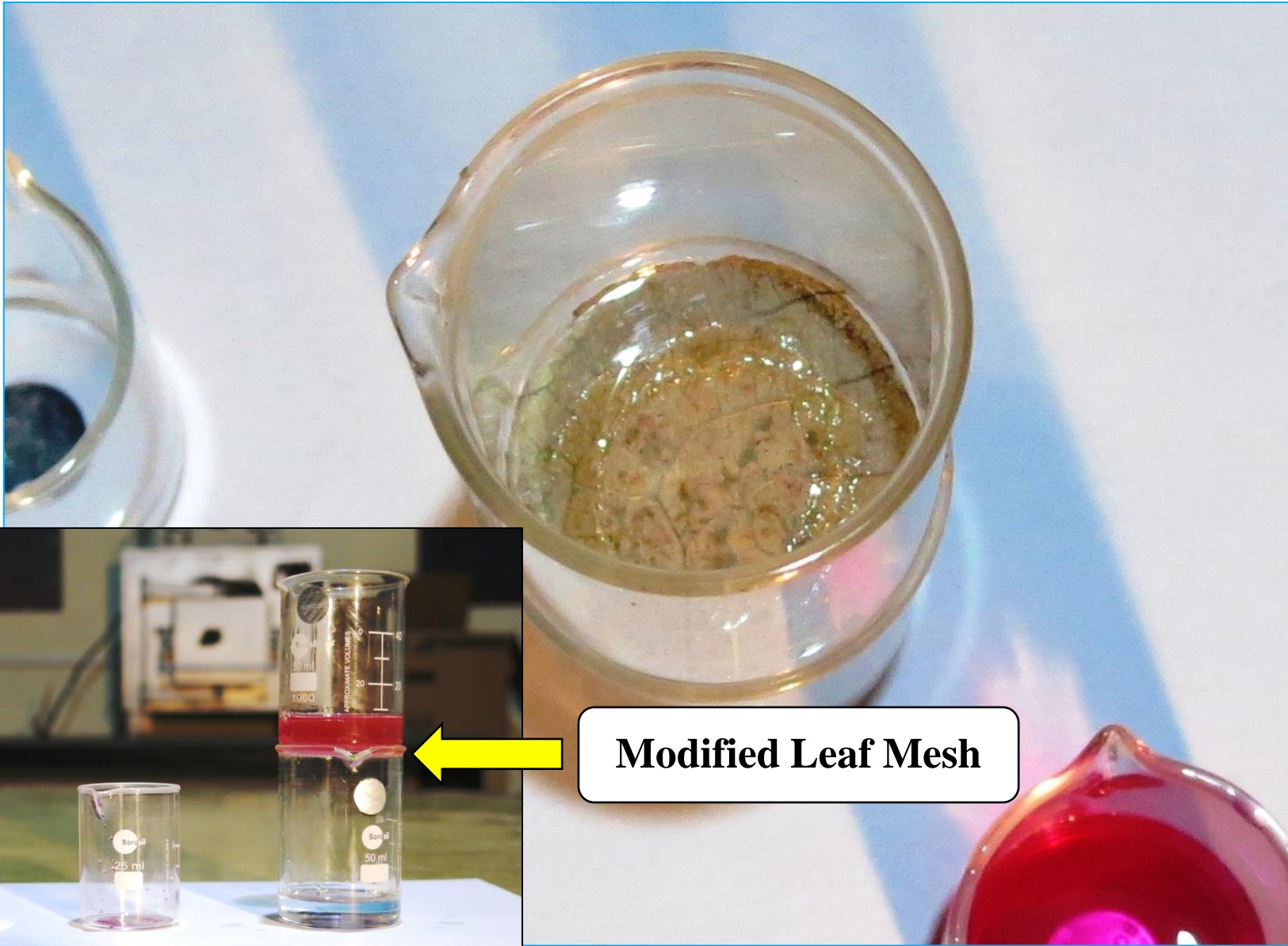
Modified Leaf Mesh



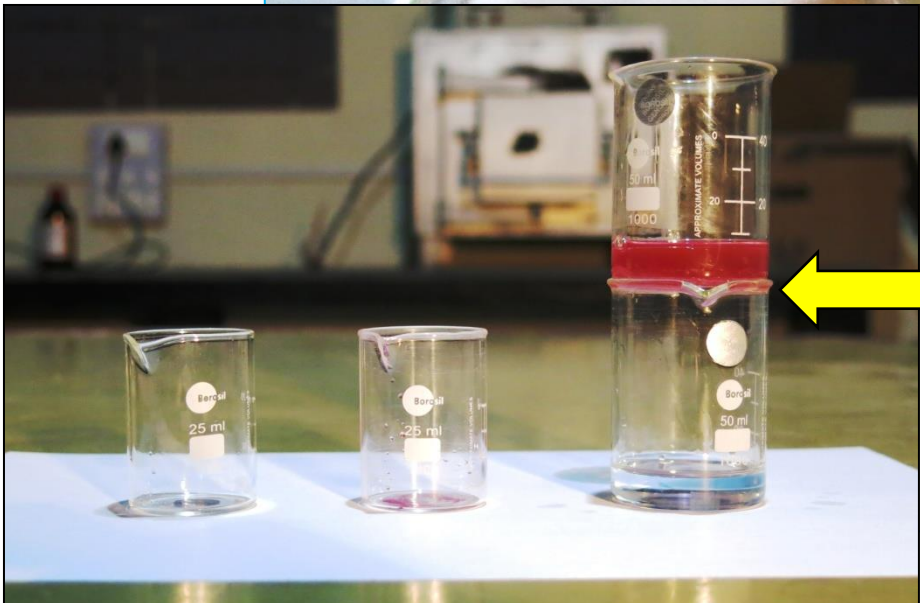
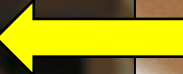
Wettability of modified Leaf Mesh

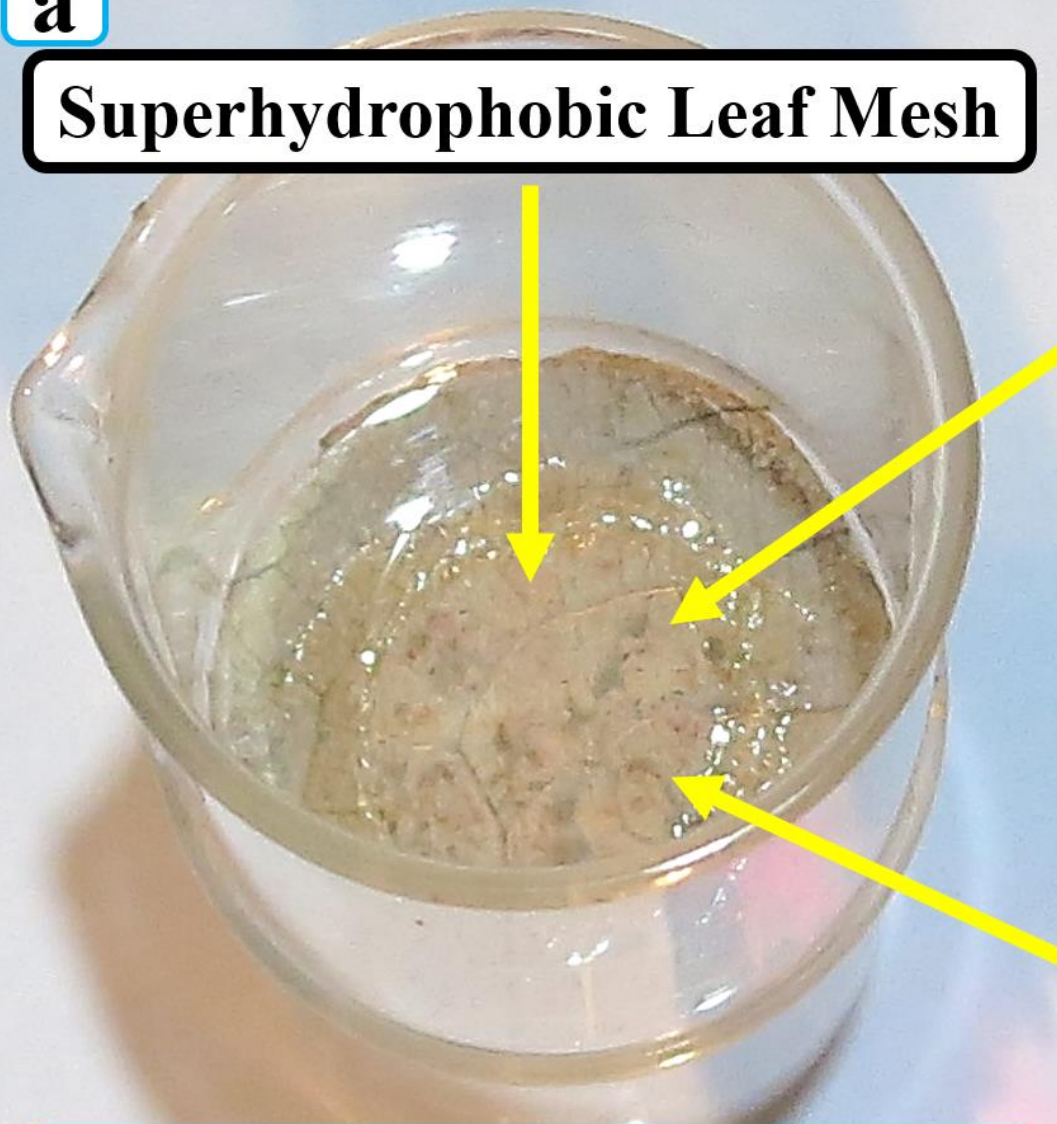
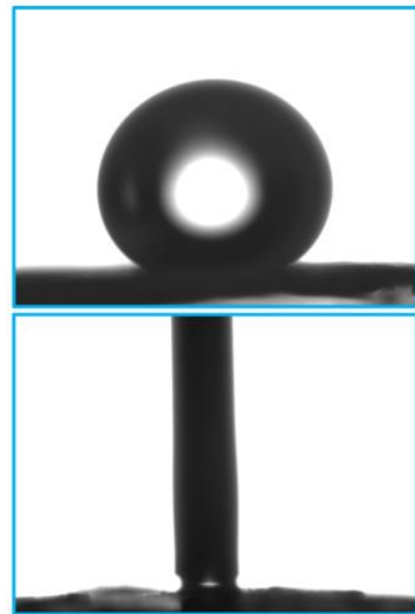


Set - up for Oil – water Separation

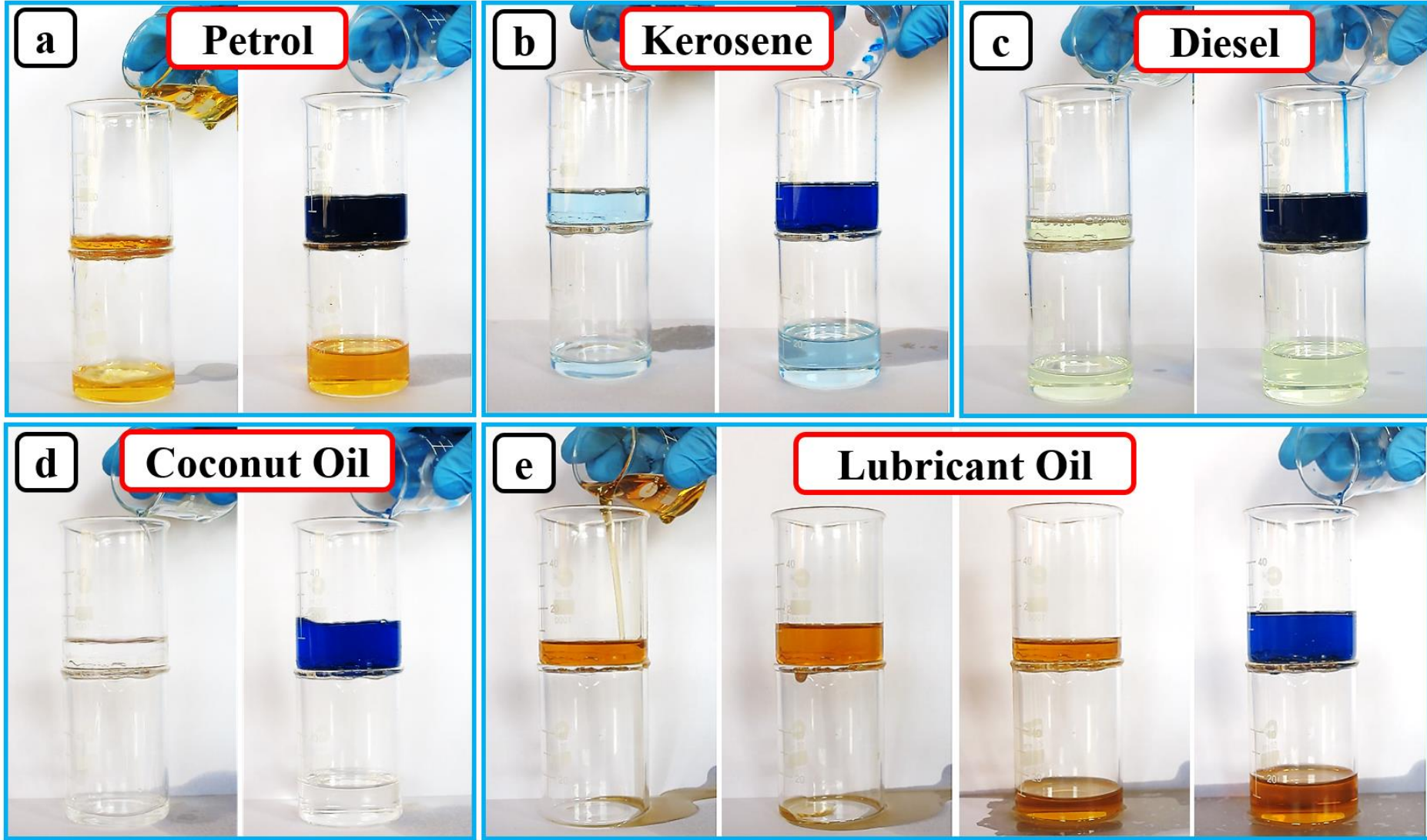


Modified Leaf Mesh

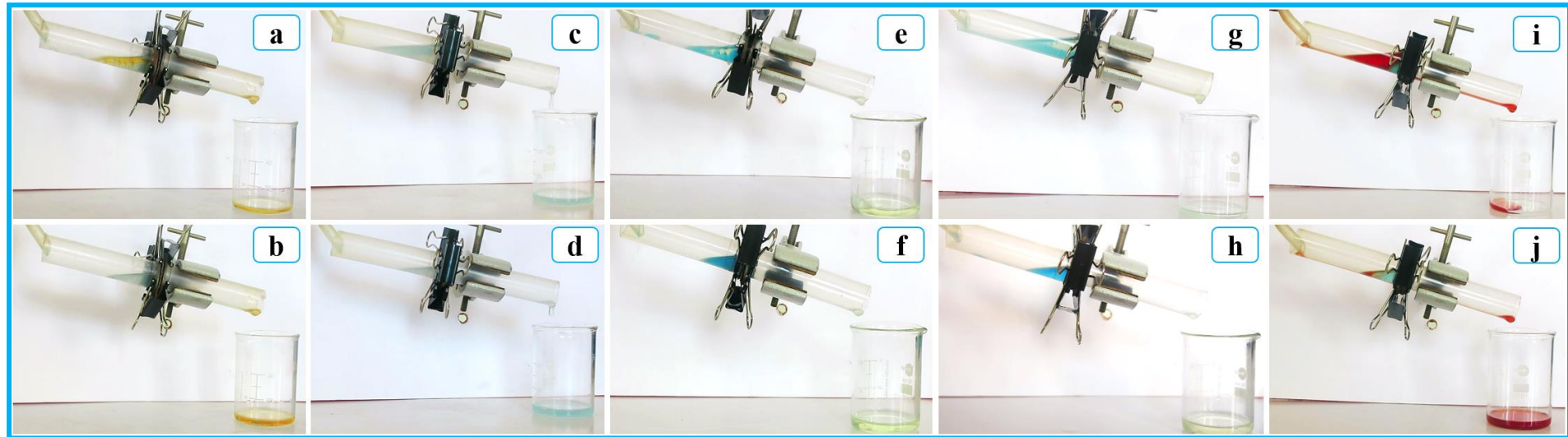


a**Superhydrophobic Leaf Mesh****Oil – Water Separation Setup****b****c****WCA ~ 162°****OCA ~ 0°**

Gravity based Oil – water Separation



Tilted Oil – water Separation



Petrol

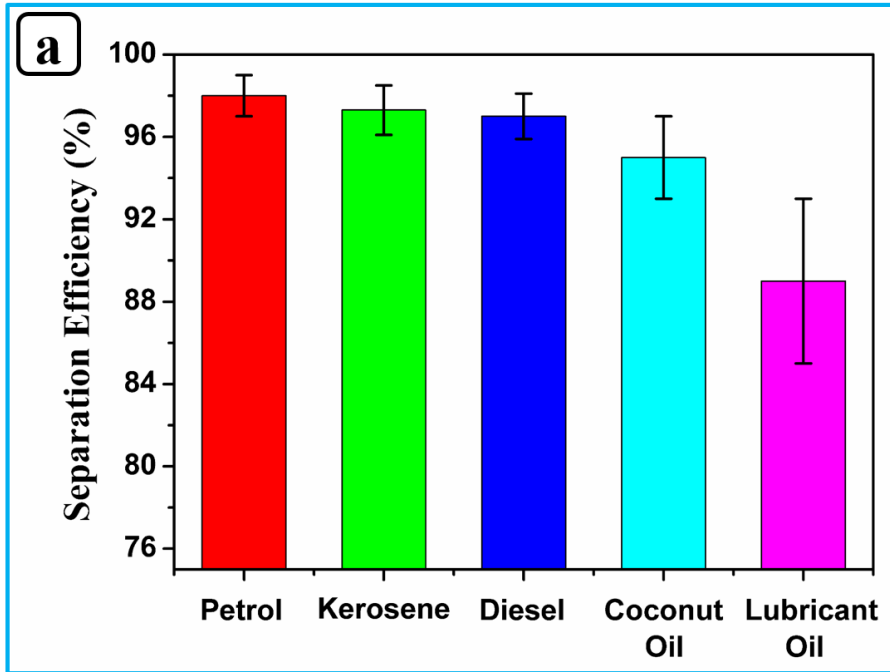
Kerosene

Diesel

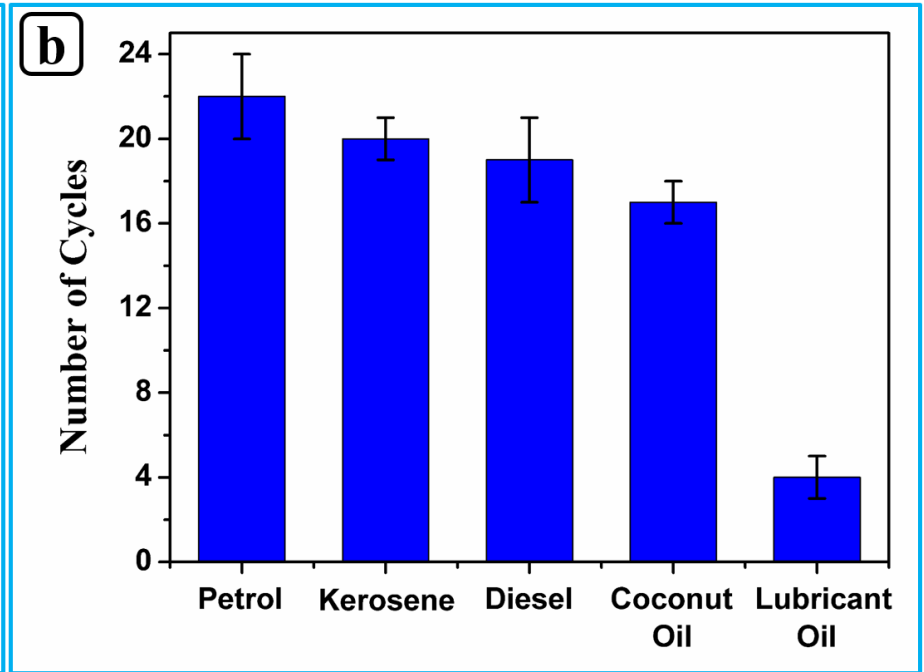
Coconut Oil

Lubricant Oil

Oil-Water Separation Efficiency



Separation Efficiency



Reusability

Conclusions

- A naturally available *Tectona Grandis* leaf mesh was used for the efficient oil-water separation.
- The crater-like superhydrophobic leaf mesh was fabricated by simple deposition of SiO₂-PS nanocomposite.
- Like other superhydrophobic materials prepared on commercially available SS and/or Cu mesh, the as prepared superhydrophobic leaf mesh also exhibited excellent oil-water separation efficiency greater than 95% for more than 18 separation cycles.
- The use of superhydrophobic mesh provides high permeation fluxes towards the oils having viscosities in the range of 0.5-55 cP.
- Our present study will encourage the researchers to search out other stable leaf meshes available in *Mother Nature*.
- The total cost of oil-water separation process can be greatly reduced in near future by adopting such novel approaches and thereby provides an eco-friendly solution.