

13. Title: Recyclable smart mesh for on demand separation of oily water

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Keywords: Oil Removing, Water removing, Superhydrophilic

Domain: Environment

Summary: A simple, eco-friendly and scalable nanostructured smart surface mesh is developed. For the development of Smart mesh, ZnO nanowires (NWs) obtained from the chemical vapor deposition method were coated on a stainless steel (SS) mesh. The as-synthesized ZnO-NWs-coated mesh shows superhydrophilic/underwater superoleophobic behavior. This mesh works in “water-removing” mode, where the superhydrophilic as well as underwater superoleophobic nature allows the water to permeate easily through the mesh while preventing oil. The wetting property of ZnO-NWs-coated mesh can be switched easily from superhydrophilic to superhydrophobic state and vice versa by simply annealing. The separation is solely driven by gravity. Thus, the reversible wettability of ZnO NWs provides a smart surface mesh which can be switched between “oil-removing” and “water-removing” modes.

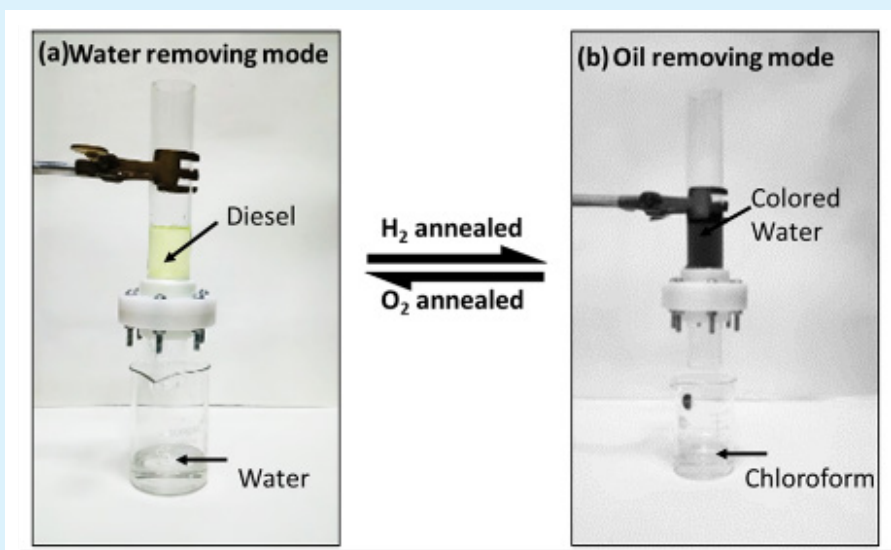


Diagram: Snapshots of filtration process in water removing and oil removing mode

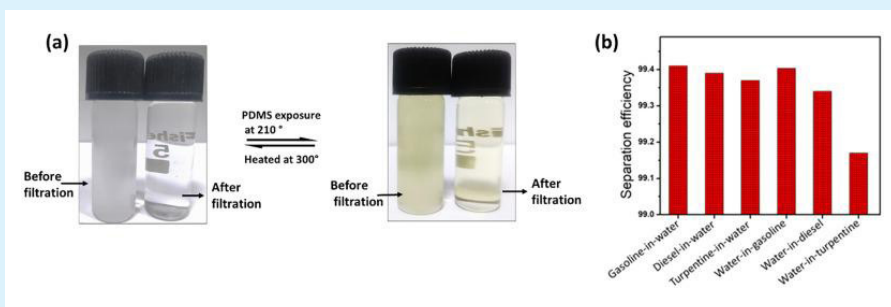


Figure: Filtration process in water-removing and oil-removing modes

Advantages:

- » Applicable for variety of oil/water mixtures and both O/W and W/O emulsions
- » The separation mesh was found to be switchable reversibly for more than 10 cycles
- » The ZnO selected in this work being inexpensive, eco-friendly and inorganic material, which eliminates the possibility of degradation of the material with time.
- » High filtration efficiency of about 99.9%. stayed relatively invariant, indicating a prolonged oil anti-fouling property
- » Reversible wetting properties
- » Promising for sewage treatment and oil recovery from industrial and household discharge
- » All in one solution for urgent demand to access clean water and recycling waste oil

Applications:

- » Metallurgical and petroleum refineries.
- » Oily wastewater treatment.

Scale of Development: A functional prototype is developed and tested in Laboratory environment.

Technology Readiness Level: 4

IP Status: Granted Indian Patent 335730