Superhydrophobic and Superoleophilic Graphene Coated Melamine Sponge for Oil-Water Separation

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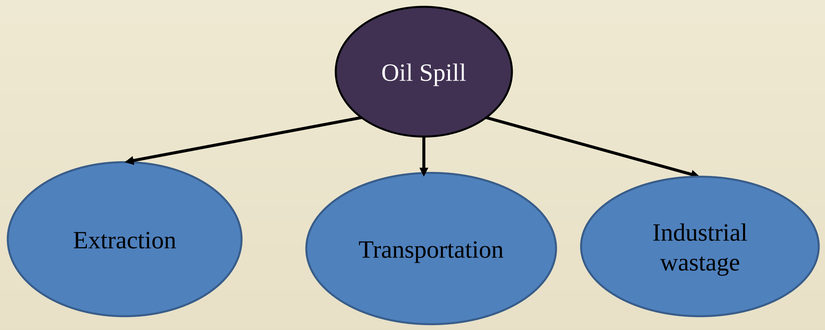
Introduction

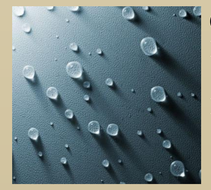


- In a massive oil spill accident in the **Gulf of Mexico in 2010**, approximately **4.9 million barrels of oil spilled**.
- This accident mostly impacted **marine species and seagrasses**.
- Out of **322 species**, **53 species** were threatened and **29** were nearly threatened, including **16 species** of **sharks** and **eight corals**.

Hydrophobic Material

Natural Hydrophobic materials

Artificial Material

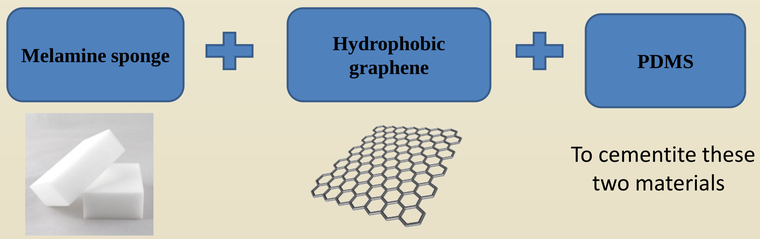


Can be fabricated by:

- The introduction of surface roughness.
- Surface modification with low energy materials.

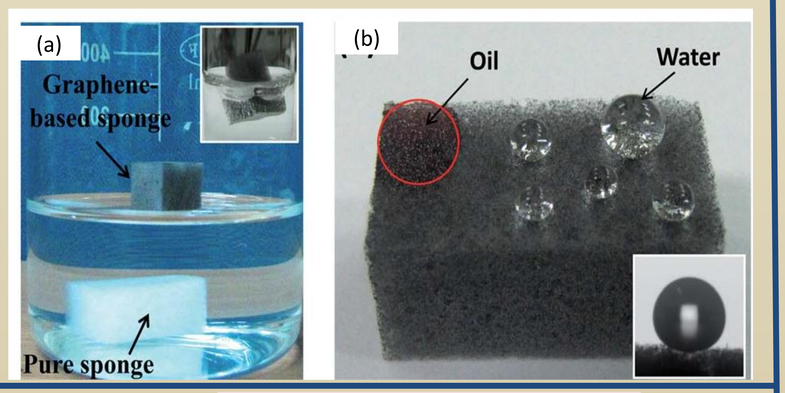
Experimental Work

Materials Used



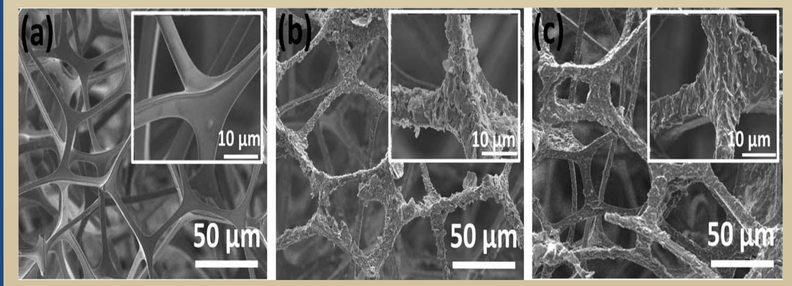
Preparation method

- A piece of the commercial sponge was first cleaned with acetone and distilled water successively using an ultrasonic cleaner, followed by drying in a vacuum oven at 100 °C for several hours to completely remove moisture.
- The as-dried sponge was then dipped into a dispersion of graphene nanosheets in ethanol, and finally dried in the vacuum oven at 100 °C for 2 hours.

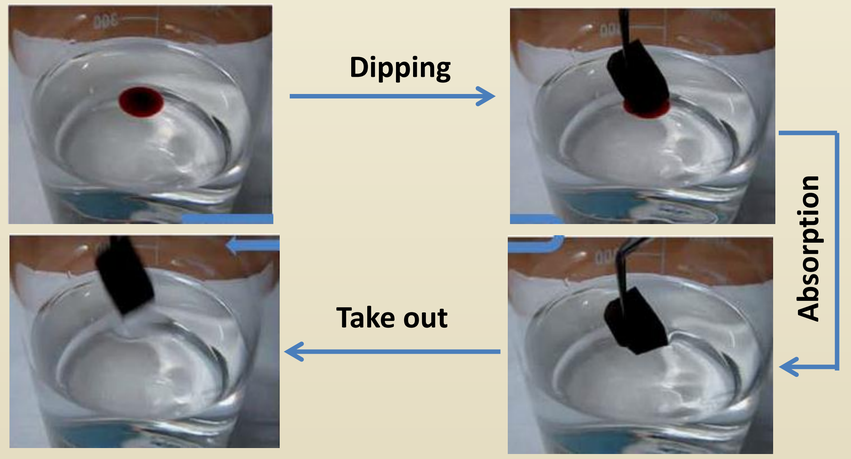


Results and discussion

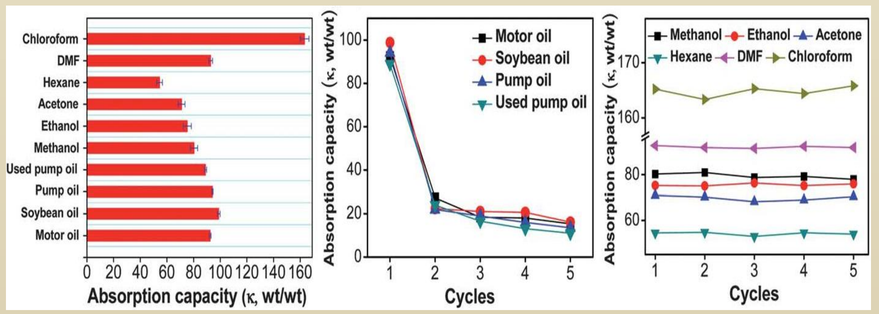
(a) Morphology: Scanning electron microscopy (SEM) micrograph of (a) pure sponge (b) graphene coated sponge and (c) graphene-PDMS coated sponge.



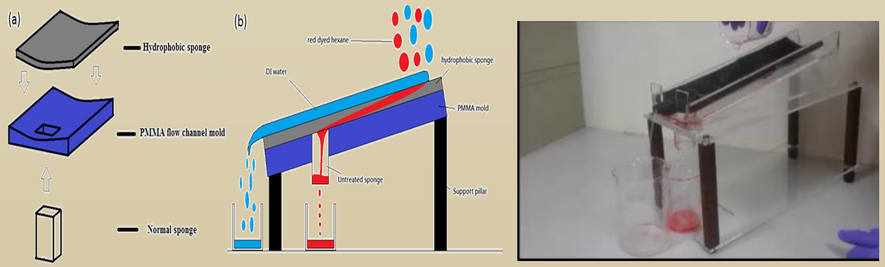
(b) Removal of oil from water



(c) Absorption capacity measurement



(d) Fluid channel for continuous separation of oil and water



Conclusion:

- A facile, inexpensive method to fabricate graphene-based sponges with superhydrophobic and superoleophilic properties.
- Easy to scale up.
- Excellent absorption capacities up to 165 times its own weight, high selectivity, good recyclability and lightweight.
- The designed fluid channel set-up can separate oil-water mixture continuously.