

A Robust and Highly Elastic Fluorinated Graphene/Poly(ethyl acrylate) Composite Sponge for Efficient Water/Oil Separation

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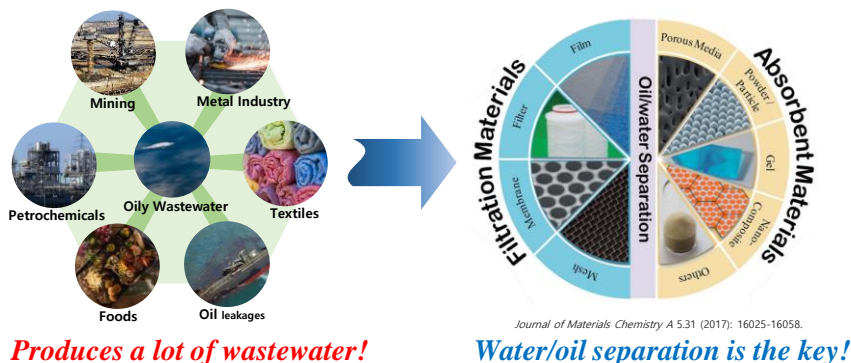
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Introduction

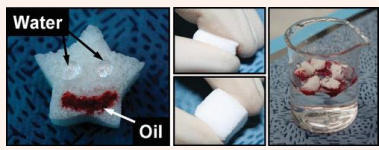
About Water/Oil Separation



- A lot of industries produce oily wastewater.
- Among the numerous method, the 'absorption method' is the most effective.
- No expense & specialized equipment, very quick, effective

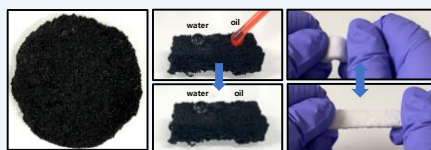
Recent Studies

PDMS Sponges



- Most of studies used PDMS as polymer matrix.
- However, PDMS possess many disadvantages.
- low mechanical properties, expensiveness, high viscosity etc.
- To solve these problems, we employed stretchable and flexible acrylate monomer for W/O separation sponges.

Our Work



Experiment

Materials

- Sodium chloride, DI water, graphene nanoplatelet (thickness 1-2nm, width <2μm), 1H,1H,2H,2H-perfluorodecyltriethoxysilane (FS), ethyl acrylate (EA), poly(ethylene glycol)dimethacrylate (PEGDMA), azobisisobutyronitrile (AIBN)

Part A, Salt Frame

- 1) Make salt paste by adding a little water.
- 2) Pour paste into the mold and evaporate the water at 80°C.
- 3) Remove the salt frame from the mold.

Part B, Fluorinated Graphene

- 1) Disperse graphene nanoplatelet in NMP.
- 2) Add FS to the graphene dispersion. (Graphene 1g : FS 0.01g)
- 3) After stirring for 24 hours, evaporate the NMP completely.

Part C, Polymer Matrix

- 1) Mix monomer, crosslinker, thermal initiator (50:1:1 weight ratio) and stir for 30 minutes.
- 2) Add fluorinated graphene to the solution (1) and stir for 2 hours.
- 3) Pour the solution (2) into the salt frame, and cured in the vacuum oven for 24 hours.
- 4) After curing, remove salt frame using sonication.
- 5) Dry sponge completely.



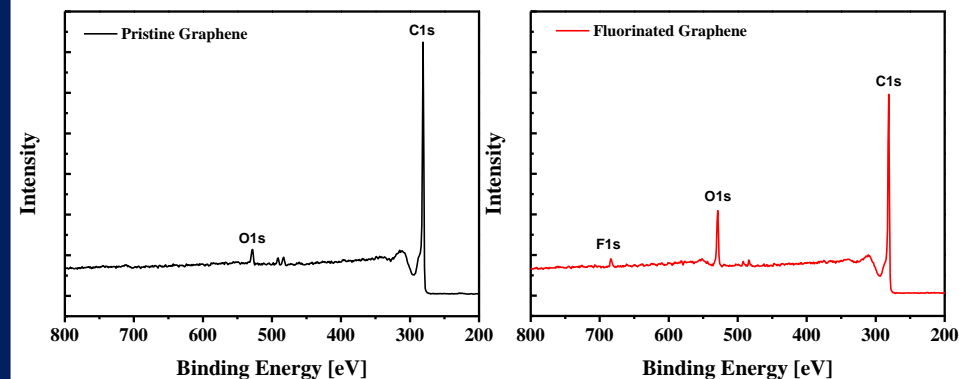
Salt Frame



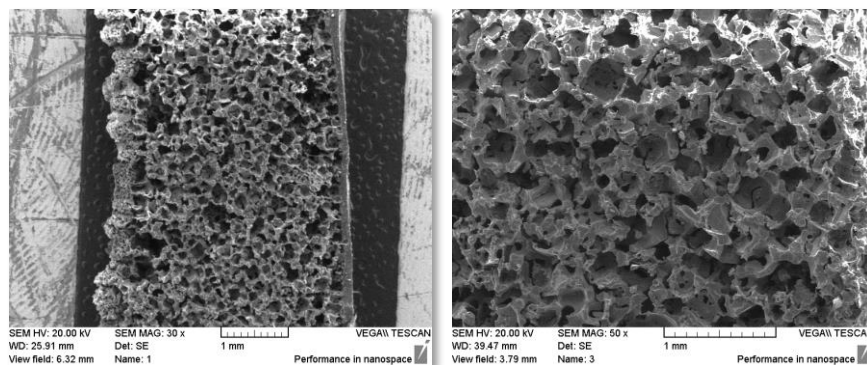
FG Sponge

Result & Discussion

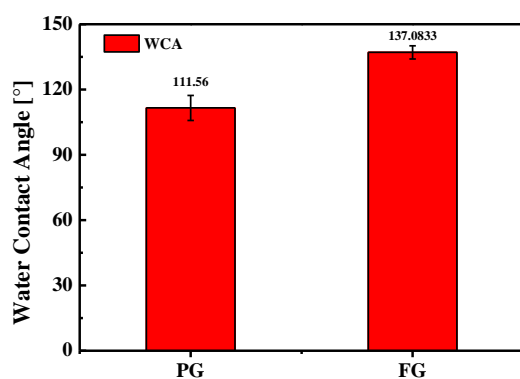
X-ray Photoelectron Spectroscopy (XPS)



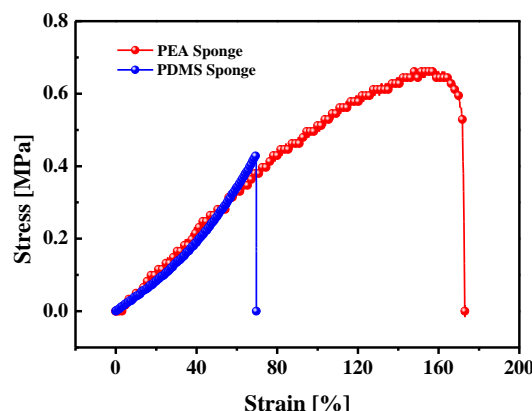
Scanning Electron Microscope (SEM)



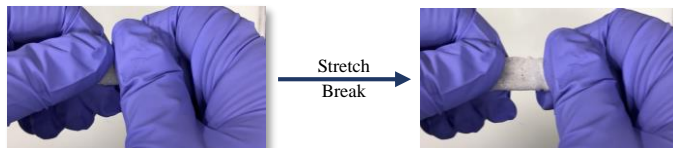
Water Contact Angle (WCA)



Ultimate Testing Machine



PDMS



PEA

