



A sustainable approach to repurpose discarded air filter for extended use in oil/water separation

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ABSTRACT

With increasing automobiles in the past decade, more and more discarded air filters (DAFs) have caused severe environmental pollution due to automobile maintenance. We proposed an efficient and simple method for preparing superhydrophobic/superoleophilicity air filter for oil/water separation to solve this problem. The DAFs were functionalized by polydimethylsiloxane (PDMS) and titanium dioxide nanoparticles to enhance its hydrophobicity and oleophilicity. The morphological study showed that the use of PDMS as a binder changed the surface structure of the coatings significantly. Oil/water separation experiments revealed that DAFs could separate various oils with separation efficiencies exceeding 99%. Importantly, Experiments have shown that the superhydrophobic/oleophilic air filter cartridge maintains a high separation efficiency (>96%) after at least ten filter cycles under oil-water mixtures with alkaline, acidic, and saline solutions. The superoleophobicity of DAFs was maintained in solutions of alkaline, acidic, and saline solutions for at least 72 h, indicating good durability and stability. More importantly, the DAFs not only removes oil from oily wastewater (such as in tanker leaks) but also realizes secondary use.

Keywords: Superhydrophobic; Superoleophilicity; Discard air filters; Ecologically beneficial; TiO₂ nanoparticles

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