Sheathed Cotton Fibers: Material for Oil-Spill Cleanup

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Abstract : Despite diverse optimization techniques on natural hydrophilic fibers, hydrophobic synthetic fibers are still the best oil sorption materials. However, these hydrophobic fibers are not biodegradable, making their disposal problematic. To this end, this work sets out to develop Nonwoven sorbents from epoxy-coated Cotton fibers. As a way of improving the compatibility of the crude oil and reduction of moisture absorption, cotton fibers were coated with epoxy resin by immersion in acetone-thinned epoxy solution. A needle-punching machine was used to convert the fibers into coherent nonwoven sheets. An oil sorption experiment was then carried out. The result indicates that the developed epoxy-modified sorbent has a higher crude oil-sorption capacity compared with those of untreated cotton and commercial polypropylene sorbents. Absorption Curves show that the coated fiber and polypropylene sorbent saturated faster than the uncoated cotton fiber pad. The result also shows that the coated cotton sorbent adsorbed crude faster than the polypropylene sorbent, and the equilibrium exhaustion was also higher. After a simple mechanical squeezing process, the Nonwoven pads could be restored to their original form and repeatedly recycled for oil/water separation. The results indicate that the cotton-coated non-woven pads hold promise for the cleanup of oil spills. Our data suggests that the sorption behaviors of the epoxy-coated Nonwoven pads and their crude oil sorption capacity are relatively stable under various environmental conditions compared to the commercial sheet.

Keywords : oil spill, adsorption, cotton, epoxy, nonwoven
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