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Synthesis and Application of Cellulose-Chitosan Sponges for the Removal of Oil Pollution and Other Organic Pollutants from Water

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Extraction and transportation of crude oil led to extensive environmental effects such as leakage into the water resources [1, 2]. Therefore, it is very important to develop new and environmental friendly methods that can remove and separate these pollutants from water and effluent with high performance [3]. Therefore, the main objevtive of the present study was synthesis and application of cellulose-chitosan sponges for the removal of oil pollution and other organic pollutants from water. In this regards, firstly cellulose was extracted from the *Platanus orientalis* tree leaves, then the sponges were synthesized in combination with chitosan by different ratios of 1:10, 3:10 and 5:10 (cellulose/chitosan) and the produced sponges called C_1-CH_{10}, C_3-CH_{10}, and C_5-CH_{10} respectivly. The surface modification (hydrophobization) of the synthesized sponge was performed by methyltrimethoxysilane vapor deposition. The structures and properties of the synthesised sponges were characterized by contact angle analysis (CA), SEM, N_2 sorption-desorption, TGA, XRD and FT-IR. Finaly, fro evaluation of the sponge efficiency, the absorption process was performed in a batch system on nine different petroleum and organic pollutants, including crude oil, motor oil, diesel, gasoline, liquid paraffin, hexane, chloroform, kerosene, and liquid edible oil. The CA images reviled that the water contact angle on cellulose-chitosan sponge were 140, 143, and 146 degrees for C1-CH10, C3-CH10, and C5-CH10 respectivly. These values indicate that the hydrophobicity of sponges increased by increasing cellulose ration. The SEM images demonstrate the porous structure of the cellulose-chitosan sponge, Which leads to an increase in the surface-to-volume ratio and consequently an increase in the absorption capacity. Moreover, the BET analysis revealed that the specific surface area were 33.2, 21.3, and 65.3 m^2/g respectively. On the other hand, according to the BJH method the average pore size of the sponges were 36.44, 21.57, and 19.71 nm, respectively. According to the absorption results, the C1-CH10sponge represent the highest absorption capacity of oil and organic pollutants and was introduced as the optimal sponge. Finally, the reusability of the sponge absorbtion was analysed, and it was used in 6 consecutive cycles without appreciable reduction in absorption capacity.

.***Keywords:*** Crude oil,Organic pollutant, oil spill, absorbent, cellulose, chitosan, sponge.

References

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