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New approach for adsorptive removal of oil in wastewater using textile fiber as alternative adsorbent

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Presently, oil spill pollution is still one of the important issues worldwide, due to their environmental and economic issues. It also remains a challenge to the environment scientists and technologist. Currently, there are many superior oil recovering materials in the market. However, because they are costly and cannot be recycled repeatedly, the emergency oil recovery operation at oil spills has its own oil-saturated wastes that require expensive post-treatment, adding tremendous cost to the oil recovery process. So, the use of potential and low cost, as well as an environment friendly sorbents instead of conventional adsorbent material is still necessary. Nowadays, natural and synthetic sorbents are applied for oil spill cleanup due to their availability, rapid and cost saving characteristics, eco-friendliness and reduced environmental effects, which are one of the main challenges in commercial manufacturing. However, there are several works that have been conducted to use natural and synthetic adsorbent materials such as kenaf fiber, sugarcane bagasse, crumb rubber, polyurethane foam, polypropylene fiber and silica nanopowder, in the removal of oils from water-oil system. In this study, recycled textile fiber obtained from used tires (TF) has been selected as low cost adsorbent for oily wastewater treatment using static system. Crude oil and used corn oil were selected as a model of petroleum and non-petroleum oils, respectively. The effect of operational parameter such as contact time and sorbent dose on the sorption capacity and oil removal efficiency during sorption system were investigated. The evaluation of sorbent efficiency for only oil uptake, which is called "dry system", was also studied. Compressed textile fiber using mechanical de-vulcanization method to remove oil from the layer oil system was also studied using oil layer bath. From analytical point of view, each experiment was performed three times under the same conditions and the average results were taken. Based upon the experimental results of this study, following results are obtained: The maximum adsorption capacity and removal percentage for 1 g sorbent in 50 ml water containing 4.62 g of used cooking oil and crude oil using 150 ml glass beakers were found to be 4.33 g/g and 94% for cooking oil, and 4.5 g/g and 97.4% for crude oil respectively at sorption temperature of 5oC; adsorption capacity for dry system was also evaluated for both oils and maximum adsorption capacity was obtained about 17 g/g for used cooking oil, and 25.7 g/g for crude oil which reached duration of 72 hr; regeneration results of the fiber sorbent showed that reuse of recycled textile fiber for three times is possible without a reduction in oil sorption capability; although the compressed TF showed less sorption capacity than uncompressed fiber, but also showed that it could be used for the storage and transport of recovered oil and the adsorbed oil does not leaches out at room temperature; and finally, the results also indicate that TF can be used without activation and any chemical previous treatment for oil spill cleanup.

Biography

M Sulyman was born in 1976. He got his MSc. degree in 2008 from Academy of Graduate Studies and the B.Sc. degree in 2000 from Al-Mergheb University in the field of chemical engineering in Libya. Currently he is a PhD student at Polymer Technology Department, Gdansk University of Technology in Poland. His interests of research are environmental and polymer engineering. His main research is asphalt polymer blend using polymer waste materials. Additional interest work is wastewater treatment using green adsorbents prepared from agricultural by-products/wastes

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