Oil Sorption Behavior of Natural Kapok Fiber as an Alternative to Commercial Synthetic Fiber

ABSTRACT

Oil contamination is attracting the world's attention because it is the major challenge for most river pollution. Considering that as a serious problem, this research attempted to study the oil sorption behavior of natural raw kapok fiber (RKF); which is renewable and inexpensive, as compared to commercial synthetic fiber such as polypropylene fiber. The medium of oil that is used to test the oil sorption fibers' behavior is waste cooking oil (WCO) and used engine oil (UEO). The oil sorption capacity of RKF for WCO and UEO is 50.17 g/g and 49.51 g/g, whereas polypropylene fiber has a lower oil sorption capacity of 34.34 g/g and 30.01g/g, respectively. Interestingly, the efficiency of RKF's oil sorption capacity was further enhanced by NaOH treatment. In this study, the optimum concentration of NaOH treatment on kapok fiber was determined at 0.02M; where the oil sorption capacity of treated kapok fiber (TKF) was further increased to 77.94 g/g for WCO and 62.63 g/g for UEO. In terms of oil recovery from the oil-water mixture, TKF has recovered 98% of WCO at both lowest (0.5%v/v) and highest (2.5%v/v) concentrations of WCO-water mixture used; while RKF has recovered 84% of WCO at 0.5% v/v WCO-water mixture; and 95% of WCO at 2.5% v/v WCO-water mixture. At 0.5% v/v of the UEO-water mixture, TKF and RKF were able to recover 88% and 84% UEO. When the concentration of the UEO-water mixture was increased to 2.5% v/v, both the TKF and RKF achieved high recovery efficiencies of 100% and 99% for UEO, respectively. TKF is proven to have better reusability than the RKF due to its lower percentage reduction of oil sorption capacity after six cycles, TKF has only 22.69% compared to RKF's (30.79%) for WCO, and 25.81% compared to RKF's (40.87%) for UEO.