

Removal of light petroleum hydrocarbons from water sources using polypropylene and titanium dioxide nano-composite

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Abstract

Background: Petroleum hydrocarbons are the most important pollutants which threaten human health and aquatics. Adsorbents are one of the common equipment in water pollution management; however, their applications have been associated with limitations.

Objective: To evaluate the potential of polypropylene/titanium dioxide Nano-composite in adsorption of light petroleum hydrocarbons from water sources.

Methods: This experimental study was conducted at school of health, Qazvin University of Medical Sciences in 2014-15. Activation of polypropylene fibers, with 1 cm length and 300 microns diameters, was achieved with wet heating. To synthesize of nano-composite the fibers were coated with nano-titanium dioxide with 20 nm diameter. The sonication was performed at 26 kHz and 100 W of power in 40°C. The morphology of the fractured surfaces of impact specimens was examined by FESEM. The adsorption rate of petrol and gasoline, as surrogate of TPH, was evaluated in different retention time within polyamide mesh aperture diameter of 250 nm. Average of TPH adsorbing, per unit weight of adsorbent, were analyzed with analysis of variance and Scheffe post hoc tests.

Findings: The FESEM micrographs showed that the dispersion of the nano-TiO₂ particles was relatively good and only few aggregations exist. The maximum adsorption capacity of petrol and gasoline was obtained in 30 minute. The adsorption rate of gasoline was 6.49±0.10 g/g and oil was 7.01±0.13 g/g.

Conclusion: According to the results and in comparison with commercial imported adsorbents, the synthesized Nano-composite had favorable performance. The results show that the polypropylene/TiO₂ Nano-composite can be used effectively in light petroleum hydrocarbons removal from polluted water sources.

Keywords: Water Pollution, Environment Sanitation, Nano-Composite, Adsorption

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