Title: Preparation of magnetic carbon nanotube nanocomposite for enhancing the separation of dissolved hydrocarbon from petroleum wastewater

Authors: Y.M. Moustafa, A.M. Al-Sabagh, S.A. Younis, Mostafa M.H. Khalil, M.O. Abdel-Salam

PII: S2213-3437(17)30159-8
DOI: http://dx.doi.org/doi:10.1016/j.jece.2017.04.023
Reference: JECE 1572

To appear in:

Received date: 12-1-2017
Revised date: 14-3-2017
Accepted date: 12-4-2017

Please cite this article as: {http://dx.doi.org/

<AT>Preparation of magnetic carbon nanotube nanocomposite for enhancing the separation of dissolved hydrocarbon from petroleum wastewater

<AU>Y. M. Moustafa[a], A. M. Al-Sabagh[a], S. A. Younis[a]*
##Email##sherifali_r@yahoo.com##/Email##, MostafaM.H. Khalil[b], M. O. Abdel-Salam[a]*
##Email##dabdelsalam2008@yahoo.com##/Email##
<AFF>[a]Egyptian Petroleum Research Institute, Nasr City, P.O. 11727, Cairo, Egypt.
<AFF>[b]Chemistry Department, Faculty of Science, Ain Shams University, 11566 Abassia, Cairo, Egypt

<PA>Fax: (+202)22747433.

<ABS-Head><ABS-HEAD>Graphical abstract
<ABS-P>
<ABS-P><xps:span class="xps_Image">fx1</xps:span>
<ABS-HEAD>Highlights► MWCNTs/ magnetite/SiO_2 were prepared using dip coating method. ► Application of MWCNTs/magnetite/SiO_2 in oil/water separation. ► The amphoteric MMWCNTs /SiO_2 have excellent affinity with oil-water separation. ► MMWCNTs /SiO_2 could be reused several times up to 5 times.
<ABS-HEAD>Abstract

<ABS-P>Multi-walled carbon nanotubes decorated with magnetite (MMWCNTs) were prepared then modified with silicon oxide (MMWCNTs/SiO_2) and characterized using high-resolution transmission electron microscope (HRTEM), dynamic light scattering (DLS), thermal gravimetric analysis (TGA), Fourier transform infrared photometer (FTIR), and X-Ray diffraction techniques (XRD). A bench scale experimental setup was designed for the oil in water mixture separation of the prepared materials. Subsequently, individual and interaction effects of operational parameters, e.g., MMWCNTs and MMWCNTs/SiO_2 doses, initial oil concentration, pH and water salinity were investigated and optimized using response surface methodology (RSM) and ANOVA analysis at $\alpha = 0.05$. The results of experimental data were fitted with polynomial models developed using RSM, and the regression analysis with an R^2 value of ≈ 0.99 showed the goodness of fit for the experimental results with predicted values. The experimental results showed higher oil/water separation for MMWCNTs/SiO_2 than MMWCNTsitself with a separation rate of 92.8% and 72.4%, respectively at 1 g/l of initial oil concentration. Compared with other approaches for fabricating oil-water materials, the as-prepared MMWCNTs/SiO_2 is a promising candidate for efficient oil-water separation even after 5 cycles.
<KWD>Keywords: Multiwall carbon nanotubes; magnetic nanocomposite; hydrocarbon separation; column studies; response surface optimization.

<H1>1. Introduction