COD (TPH)

Sorur.Safa@gmail.com

(TPH) (PAH$_s$)

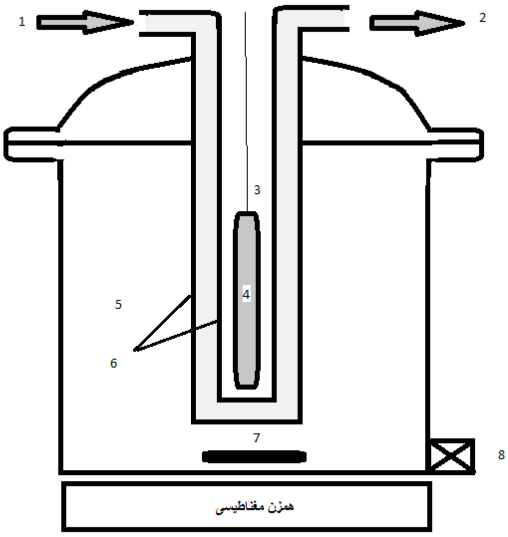
pH H_2O_2 UV (wh...)

COD H_2O_2 pH COD $pH=$ mM UV pH UV $(pH=)$ COD

(TPH) UV/Fe^{2+}/H_2O_2

[illegible]

[illegible]


1
2
3
4
5
6
7
8
همزن مغناطیسی

[illegible]

[illegible] .(ĥĬ) [illegible]

[illegible]

[illegible] UV [illegible]

[illegible] UV [illegible]

[illegible] کارايي حذف فرايند

مجزاي UV، Ē/Čħ ٪ بوده است.

[illegible]

[illegible] UV/Fe/H_2O_2 [illegible]

[illegible] $(FeSO_4.7H_2O)$ [illegible] mM [illegible]

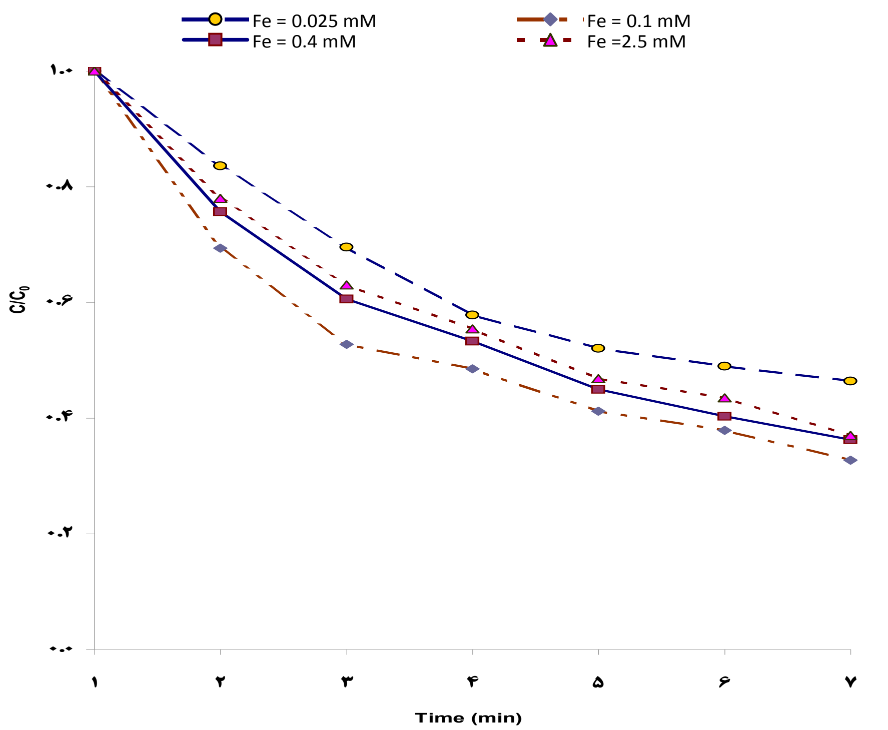
[illegible] H_2O_2 [illegible] pH=Ħ [illegible]

[illegible] H_2O_2 [illegible] UV [illegible]

[illegible] COD [illegible] m M [illegible]

[illegible] (Ĥ) [illegible]

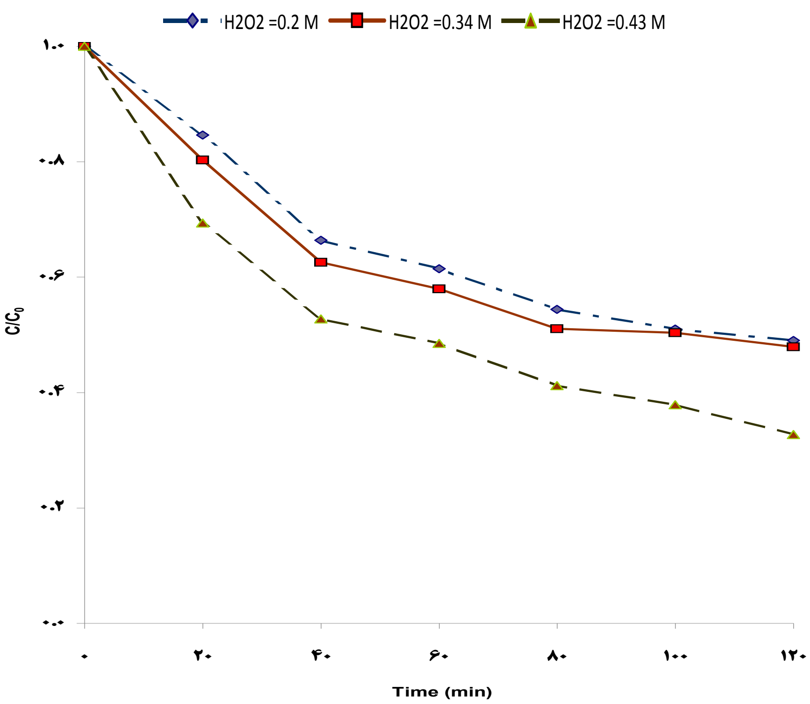
[illegible] m M [illegible]



[illegible] COD [illegible] UV/Fe/H_2O_2

(UV=ħĝĝ w ¡H_2O_2= ĝ/ħĦ mol¡pH=Ħ ,COD_0 =ĦĪĭĝ -ħĬĝĝ mg/L)

[illegible]



[illegible] H_2O_2 [illegible] COD [illegible] $UV/Fe/H_2O_2$

$(UV=[illegible]\ w, (FeSO_4.7H_2O)_{opt}= [illegible]\ mM, (pH)_{opt}=[illegible])$

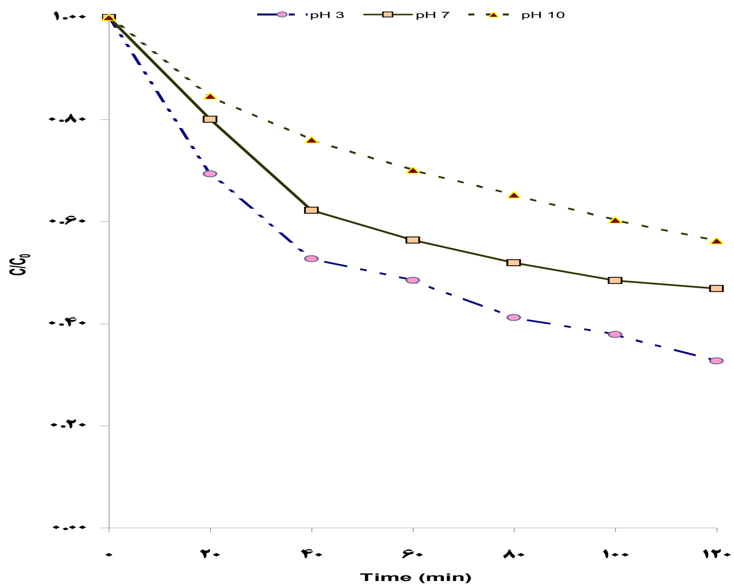
ln (C/C$_0$)

Fe(II)

$$Fe^{+2}+H_2O_2 \rightarrow Fe^{+3}+OH^-+HO^0$$

UV Fe(II) Fe(II) Fe(II) COD COD mM COD mM

UV Fe(II) (HO^0) H_2O_2 COD H_2O_2 H_2O_2 H_2O_2 H_2O_2



UV/Fe/H$_2$O$_2$ COD pH

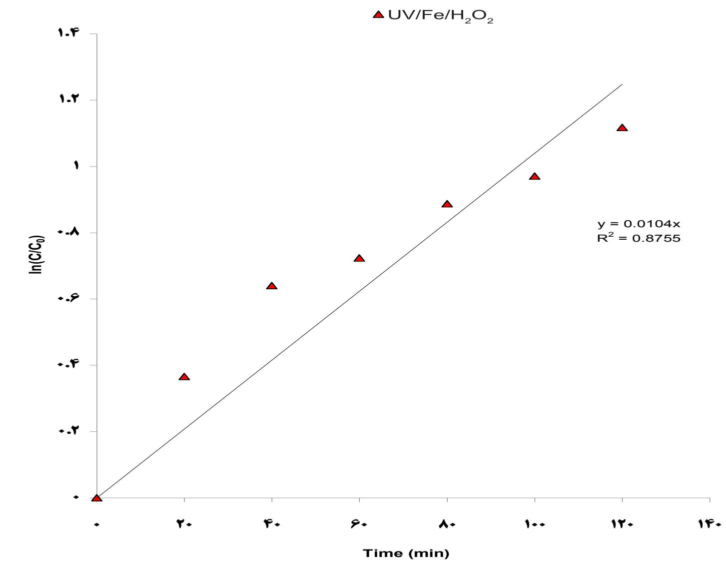
(UV= w ,(FeSO$_4$.7H$_2$O)$_{opt}$= mM ,(H$_2$O$_2$)$_{opt}$= mol)

$$HO^0+H_2O_2 \rightarrow H_2O+HO^0_2$$

$$2HO^0_2 \rightarrow H_2O_2+O^0_2$$

COD ... Kang ... Hua ... BTX ... Fe^{2+} ... H_2O_2 ... mM ...

BTX ... H_2O_2 ... Fe^{2+} ... mM ... Osvaldo ... Chiavone-Filho ... H_2O_2 ... mM ... pH ... UV ... H_2O_2 ... pH ... Raquel F. PupoNogueira ... TritonX-100 (TX-100) ...



UV/Fe/H_2O_2 ... COD ...

(UV= ... w ,$(FeSO_4.7H_2O)_{opt}$= ... mμ ,$(H_2O_2)_{opt}$= ... mol ,$(pH)_{opt}$= ...)

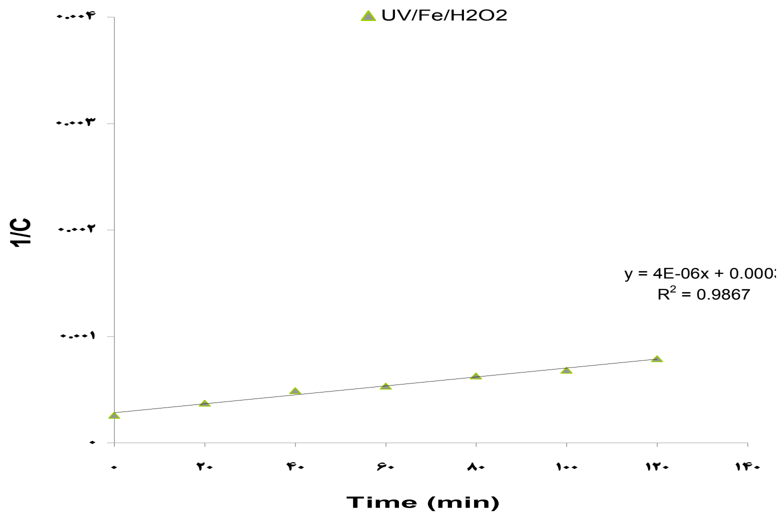
pH ... PupoNogueira ... J. Watts ... BTX ... pH ... UV/Fe/H_2O_2 ... Kavitha ... Palanivelu ... mg/L ... pH ... min ... Farrokhi ... (TCP) ... (H_2O_2 ... mM ... Fe^{+2} ... mM) ... pH ... TCP ... min ... TPH ... UV ... COD ... Osvaldo ... UV ...

k ... COD ...

$$\frac{1}{C}-\frac{1}{C_0}=k.t$$

COD ... Farrokhi ...

COD ... (pH) ...



COD ... UV/Fe/H_2O_2

(UV=... w ,$(FeSO_4.7H_2O)_{opt}$= ... mM ,$(H_2O_2)_{opt}$= ... mol ,$(pH)_{opt}$= ...)

[illegible]

[illegible]

[illegible]

[illegible]

1. Todd GD, Chessin RL, Colman J. Toxicological profile for total petroleum hydrocarbons (TPH). Georgia: U.S. Department of health and human services. Public Health Service. Agency for Toxic Substances and Disease Registry; 1999 Sep.
2. Flotron V, Delteil C, Padellec Y, Camel V. Removal of sorbed polycyclic aromatic hydrocarbons from soil, sludge and sediment samples using the Fenton's reagent process. Chemosphere. 2005;59:1427-37.
3. Mouton J, Mercier G, Blais JF. Amphoteric surfactants for PAH and lead polluted- soil treatment using flotation. Water, Air, and Soil Pollution. 2009;197(1-4):381–93.
4. Feng D, Lorenzen L, Aldrich C, Mare´ PW. Ex situ diesel contaminated soil washing with mechanical methods. Minerals Engineering. 2001;14(9):1093-100.
5. Chu W, Chan KH. The mechanism of the surfactant-aided soil washing system for hydrophobic and partial hydrophobic organics. Science of The Total Environment. 2003;307(1-3):83-92.
6. Fabbri D, Prevot AB, Zelano V, Ginepro M, Pramauro E. Removal and degradation of aromatic compounds from a highly polluted site by coupling soil washing with photocatalysis. Chemosphere. 2008;71(1):59-65.
7. Lee M, Kang H, Do W. Application of nonionic surfactant-enhanced in situ flushing to a diesel contaminated site.Water Research. 2005;39:139-46.
8. Chou DK, Krishnamurthy R, Randolph TW, Carpenter JF, Manning MC. Effects of Tween 20 and Tween 80 on the stability of Albutropin during agitation. Journal of Pharmaceutical Sciences. 2005;94(6):1368–81.
9. Daneshvar N, Aber S, Vatanpour V, Rasoulifard MH. Electro-Fenton treatment of dye solution containing Orange II: Influence of operational parameters. Journal of Electroanalytical Chemistry. 2008;615(2):165–74.
10. Wang J, Sun W, Zhang Z, Jiang Z, Wang X, Xu R, et al. Preparation of Fe-doped mixed crystal TiO2 catalyst and investigation of its sonocatalytic activity during degradation of azo fuchsine under ultrasonic irradiation. Journal of Colloid and Interface Science.

2008;320(1):202-9.

11.Zhang G, Yang F, Liu L. Comparative study of Fe2+/H2O2 and Fe3+/H2O2 electro-oxidation systems in the degradation of amaranth using anthraquinone/polypyrrole composite film modified graphite cathode. Journal of Electroanalytical Chemistry. 2009;632:154-61.

12.Han DH, Cha SY, Yang HY. Improvement of oxidative decomposition of aqueous phenol by microwave irradiation in UV/H2O2 process and kinetic study. Water Research. 2004;38(11):2782-90.

13.Villa RD, Trovo AG, Pupo Nogueira RF. Soil remediation using a coupled process: Soil washing with surfactant followed by photo-Fenton oxidation. Journal of Hazardous Materials. 2010;174:770-5.

14.Esplugas S, Gimenez J, Contreras S, Pascual E, Rodriguez M. Comparison of different advanced oxidation processes for phenol degradation. Water Research. 2002;36(4):1034-42.

15.Stepnowski P, Siedlecka EM, Behrend P, Jastorff B. Enhanced photo-degradation of contaminants in petroleum refinerywastewater. Water Research. 2002;36:2167-72.

16.Tsai TT, Sah J, Kao CM. Application of iron electrode corrosion enhanced electrokinetic-Fenton oxidation to remediate diesel contaminated soils: A laboratory feasibility study. Journal of Hydrology. 2010;380:4-13.

17.Tsai TT, Kao CM. Treatment of petroleum-hydrocarbon contaminated soils using hydrogen peroxide oxidation catalyzed by waste basic oxygen furnace slag. Journal of Hazardous Materials. 2009;170:466-72.

18.Villa RD, Trovo AG, Pupo Nogueira RF. Environmental implications of soil remediation using the Fenton process. Chemosphere. 2008;71:43-50.

19.Tchobanoglous G, Burton FL, Stensel HD. Wastewater Engineering: Treatment and Reuse. 4th ed. New York: McGraw- Hill; 2003.

20.Ghaly MY, Härtel G, Mayer R, Hasender R. Photochemical oxidation of p-chlorophenol by UV/H2O2 and photo-Fenton process: A comparative study. Waste Management. 2001;21(1):41-7.

21.Galvâo SAO, Mota ALN, Silva DN, Moraes JEF, Nascimento CAO, Chiavone-Filho O. Application of the photo-Fenton process to the treatment of wastewaters contaminated with diesel. Science of The Total Environment. 2006;367:42-9.

22.Chu W. Modeling the quantum yields of herbicide 2,4-D decay in UV/H2O2 process. Chemosphere. 2001;44(5):935-41.

23.Kang N, Hua I. Enhanced chemical oxidation of aromatic hydrocarbons in soil systems. Chemosphere. 2005;61(7):909-22.

24.Watts RJ, Haller DR, Jones AP, Teel AL. A foundation for the risk-based treatment of gasoline-contaminated soils using modified Fenton's reactions. Journal of Hazardous Materials. 2000;76(1):73-89.

25.Kavitha V, Palanivelu K. Degradation of nitrophenols by Fenton and photo-Fenton processes. Journal of Photochemistry and Photobiology A: Chemistry. 2005;170(1):83-95.

26.Farrokhi M, Mesdaghinia A, Yazdanbakhsh AR, Nasseri S. Characteristic of Fenton's oxidation of 2,4,6 Trichorophenol. Iranian Journal of Environmental Health Science & Engineering. 2004;1(1):12-8.

Application of Photo-Fenton Process for COD Removal from Wastewater Produced from Surfactant-Washed Oil-Contaminated (TPH) Soils

Mohammad Reza Mehrasbi[1], *Sorur Safa[1], Amir Hossein Mahvi[2], Ali Assadi[1], Hamed Mohammadi[1]

[1]Department of Environmental Health, Faculty of Health, Zanjan University of Medical Sciences, Zanjan, Iran

[2]Department of Environmental Health, Faculty of Health, Tehran University of Medical Sciences, Tehran, Iran

Received; 24 April 2012   Accepted; 22 July 2012

ABSTRACT

Background and Objective: The base structure of total petroleum hydrocarbons (TPH) is made of hydrogen and carbon. Widespread use, improper disposal and accidental spills of this compounds lead to long term remaining of contaminations such as organic solvents and poly aromatic hydrocarbons (PAHs) in the soil and groundwater resources, resulting in critical environmental issues. In this study, an oil-contaminated soil was washed using Tween 80 surfactant and the application of photo-Fenton process ($UV/Fe^{2+}/H_2O_2$) for treatment of the produced wastewater was evaluated.

Materials and Methods: Tween 80 is a yellow liquid with high viscosity and soluble in water. In order to determine of the photo-Fenton process efficiency, we studied effective variables including Fe concentration, pH, H_2O_2 concentration, and irradiation time. The UV irradiation source was a medium-pressure mercury vapor lamp (400 w) vertically immersed in the solution within 2 L volume glass cylindrical reactor.

Results: The results showed that efficiency of COD removal depends on the initial Fe concentration, pH, H_2O_2 concentration and irradiation time.

Under optimum conditions, (Fe: 0.1 mM, H_2O_2: 0.43 mM, pH: 3 and UV light irradiation time: 2 hours) the removal efficiency of COD was 67.3%. pH plays a crucial role in the photo-Fenton process such that the removal efficiency increased with decreasing of pH.

Conclusion: According to the results of this study, under acidic condition, this process is an efficient method for COD removal from the wastewater studied.

Keywords: Total Petroleum Hydrocarbon (TPH), Tween 80, Advanced oxidation, $UV/Fe^{2+}/H_2O_2$ process

***Corresponding Author**: *Sorur.Safa@gmail.com*
***Tel:** +98 241 7273128, **Fax:** +98 241 7273153*