

ÿ ž ž ž

COD

fTPHĒ

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ly /y :

ly /y :

fTPHĒ

fPAH<sub>s</sub>Ē

ÿ

flv ççĒ

UV

pH iH<sub>2</sub>O<sub>2</sub>

éL

pH iH<sub>2</sub>O<sub>2</sub>

COD

pH=é ÿ M

ÿ mM

COD ñ / ž

UV

žH

pH

h

UV

COD

fPH= E

ž

UV/Fe<sup>2+</sup>/H<sub>2</sub>O<sub>2</sub>

ÿ

fTPHĒ

!è

!é

!è

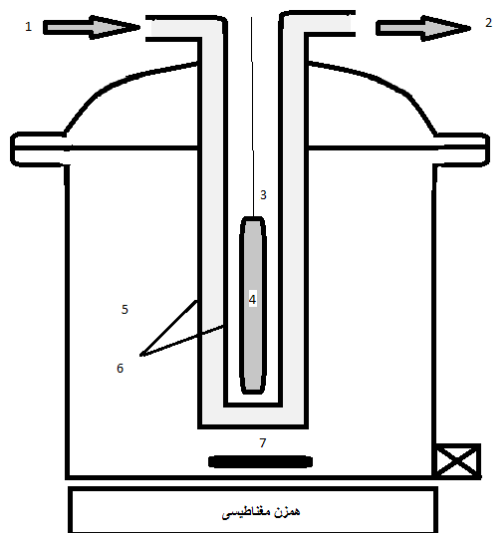
!

!





۳۰ min  
 pH  
 M NaOH  
 pH  
 H<sub>2</sub>O<sub>2</sub>  
 COD  
 COD  
 pH  
 H<sub>2</sub>O<sub>2</sub>  
 pH < ۳  
 DR5000  
 COD  
 COD = (A - B) × 1000 / V × 1000 mg/Kg  
 TPH  
 HACH COD  
 HACH COD  
 HACH COD  
 DR5000  
 Excel  
 COD



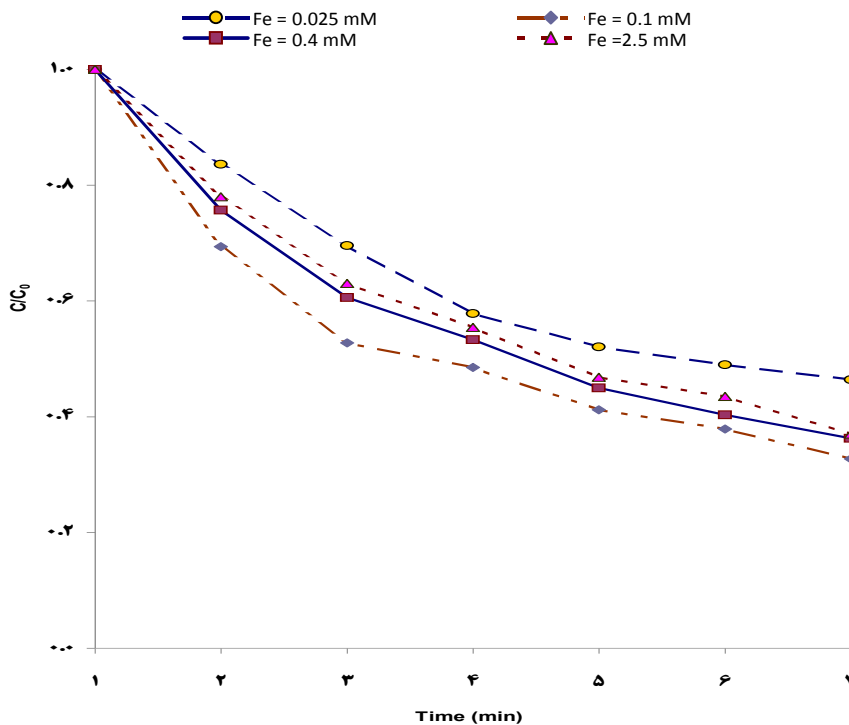
UV  
 pH  
 COD  
 COD  
 COD  
 COD

UV/Fe/H<sub>2</sub>O<sub>2</sub>  
 mM FeSO<sub>4</sub>·7H<sub>2</sub>O  
 pH = M H<sub>2</sub>O<sub>2</sub>  
 UV H<sub>2</sub>O<sub>2</sub>

m M COD  
 % /  
 f)

m M  
 m M

UV  
 UV  
 کارایی حذف فرایند  
 مجزای UV، % بوده است.



UV/Fe/H<sub>2</sub>O<sub>2</sub> COD  
 (UV = w H<sub>2</sub>O<sub>2</sub> = mol pH = , COD<sub>0</sub> = - mg/L)



$\ln(C/C_0)$

$n /$

$n$

UV Fe(II)

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

(HO<sup>0</sup> Fe(II) UV

$H_2O_2$  Fe(II) Fe(II)

COD Fe(II)

$H_2O_2$

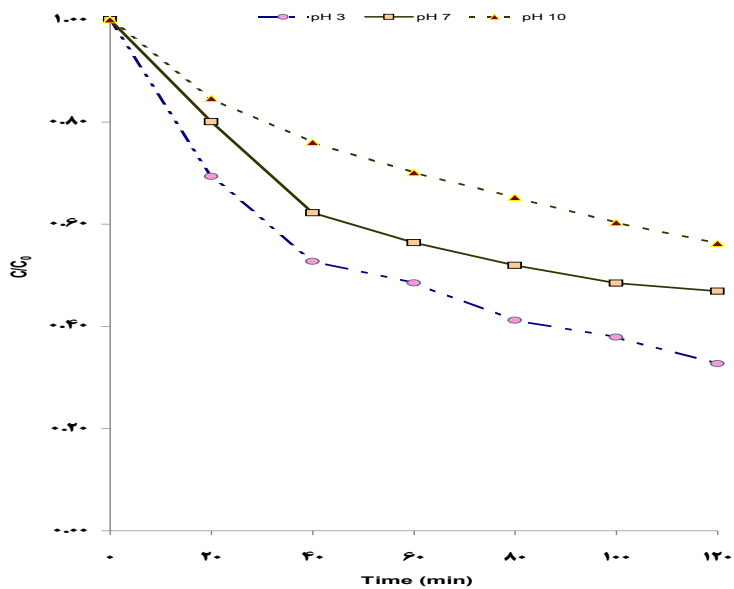
$H_2O_2$  COD

$H_2O_2$  mM COD

$H_2O_2$

$H_2O_2$

( mM



UV/Fe/H<sub>2</sub>O<sub>2</sub> COD pH

(UV= 100 W, (FeSO<sub>4</sub>·7H<sub>2</sub>O)<sub>opt</sub> = 1 mM, (H<sub>2</sub>O<sub>2</sub>)<sub>opt</sub> = 1 mol)

h BTX

Osvaldo  $\text{Fe}^{2+}$   $\text{H}_2\text{O}_2$   $\text{HO}^0 + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{HO}^0_2$   
 $2\text{HO}^0_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}^0_2$

Chiavone-Filho

$\text{H}_2\text{O}_2$

mM

pH

pH

UV

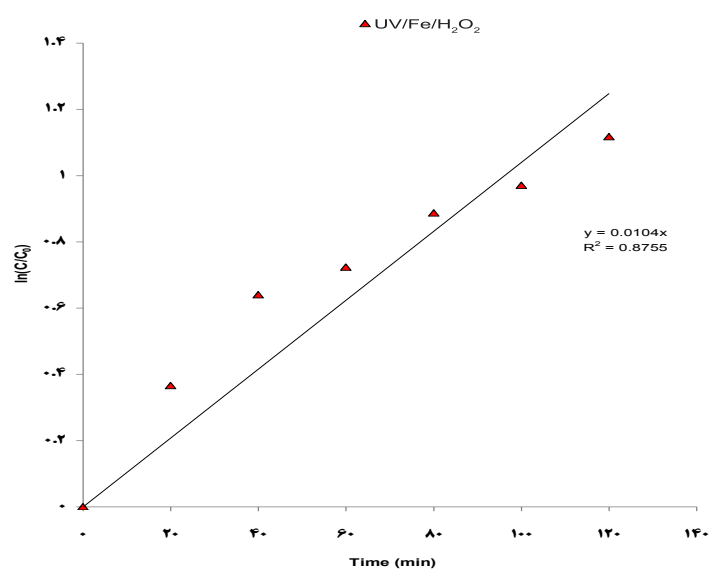
$\text{H}_2\text{O}_2$  pH

Raquel F. PupoNogueira

TritonX-100 (TX-100)

$\text{Fe}^{2+}$   $\text{H}_2\text{O}_2$

BTX

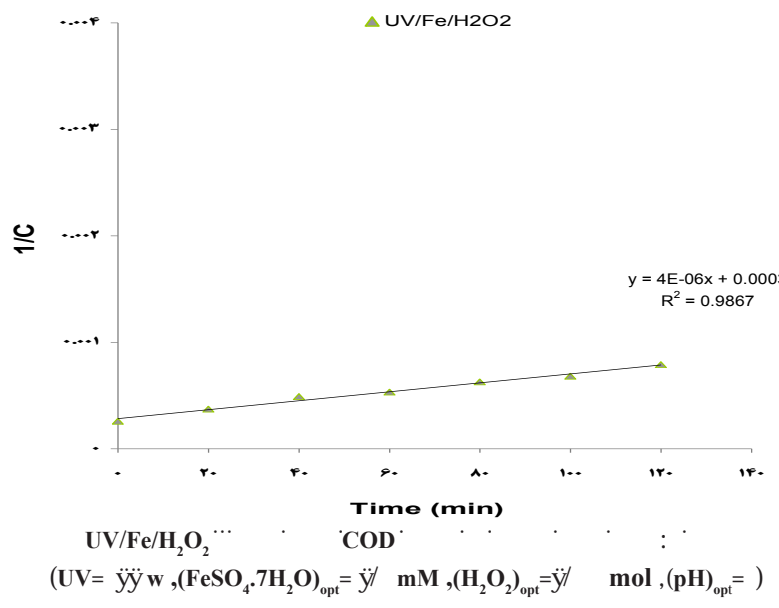


UV/Fe/H<sub>2</sub>O<sub>2</sub> COD

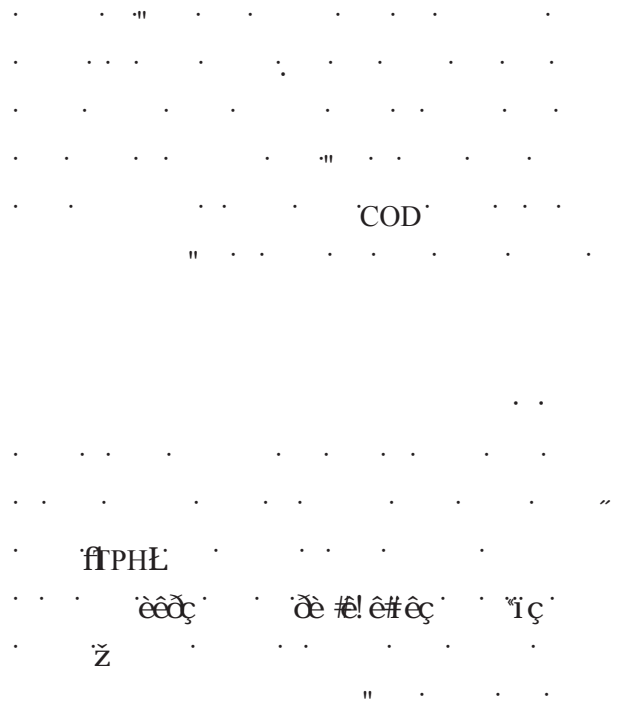
(UV= 1000 W, (FeSO<sub>4</sub>·7H<sub>2</sub>O)<sub>opt</sub> = 100 μM, (H<sub>2</sub>O<sub>2</sub>)<sub>opt</sub> = 100 mol, (pH)<sub>opt</sub> = )

$\frac{1}{C} - \frac{1}{C_0} = k.t$   
 COD  
 Farrokhi  
 UV  
 COD  
 $pH = 7$

pH  
 PupoNogueira  
 UV  
 J. Watts  
 UV/Fe/H<sub>2</sub>O<sub>2</sub>  
 Kavitha Palanivelu  
 mg/L  
 Farrokhi  
 Farrokhi  
 UV  
 COD  
 UV  
 TPH  
 COD  
 UV  
 UV



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

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### 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<sup>2+</sup>/H<sub>2</sub>O<sub>2</sub>) 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<sub>2</sub>O<sub>2</sub> 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<sub>2</sub>O<sub>2</sub> concentration and irradiation time.

Under optimum conditions, (Fe: 0.1 mM, H<sub>2</sub>O<sub>2</sub>: 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<sup>2+</sup>/H<sub>2</sub>O<sub>2</sub> process

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