[illegible]

[illegible] COD [illegible]

[illegible]

[illegible] m.malakootian@yahoo.com

[illegible]

[illegible]

[illegible] COD [illegible] Reactive Blue 19 [illegible]

[illegible] Reactive Blue 19 [illegible] Fe^{2+} [illegible] COD [illegible]

[illegible] COD [illegible] mg/L [illegible] min [illegible] mg/L [illegible] pH [illegible] mg/L [illegible] COD [illegible]

COD [illegible] Reactive Blue19 [illegible]

[illegible] Reactive Blue19 [illegible]

[illegible]

[illegible] H_2O_2 [illegible] (Fe^{2+}) [illegible] (Fe^{3+}) [illegible]

$$O_2H_2 \rightarrow O_2 + 4H^+ + 4e^- \quad (Č)$$

$$O_2 + 2H^+ + 2e^- \rightarrow O_2H_2 \quad (č)$$

$$Fe^{3+} + e^- \rightarrow 2+ Fe^{+2} \quad (Ď)$$

$$Fe^{+2} + O_2H_2 \rightarrow Fe^{3+} + OH^0 + OH^- \quad (ħ)$$

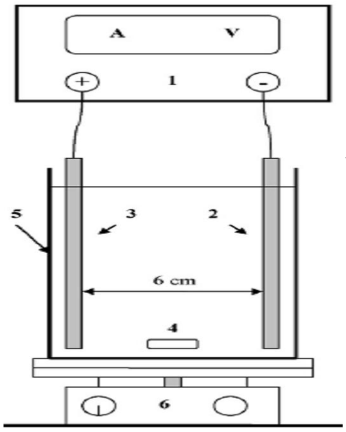
[illegible] H_2O_2 [illegible] Fe^{2+} [illegible] H_2O_2 [illegible] mercury pool [illegible] (gas-diffusion electrode) [illegible] H_2O_2 [illegible] pH [illegible] Fe^{2+} [illegible] Methyl Red [illegible] Acid Yellow 36 [illegible] Acid red 14 [illegible] Reactive black 5 [illegible] (Chlobromuron) [illegible] TOC [illegible] propham [illegible] diuron [illegible]

[illegible] Methylene Blue [illegible] RB19 [illegible] RB19 [illegible] RB19 [illegible] COD [illegible] COD [illegible]

[illegible]

[illegible] (DC power) [illegible] Spectrophotometer UV-Vis (Philips Model) [illegible] pH [illegible] PU 8740 [illegible] COD [illegible] (Hunna instrument) [illegible] COD [illegible] Excel [illegible] NaOH [illegible] H_2SO_4 [illegible] pH [illegible] M [illegible] Merck [illegible] Dystar [illegible]

[illegible] pH [illegible]


A
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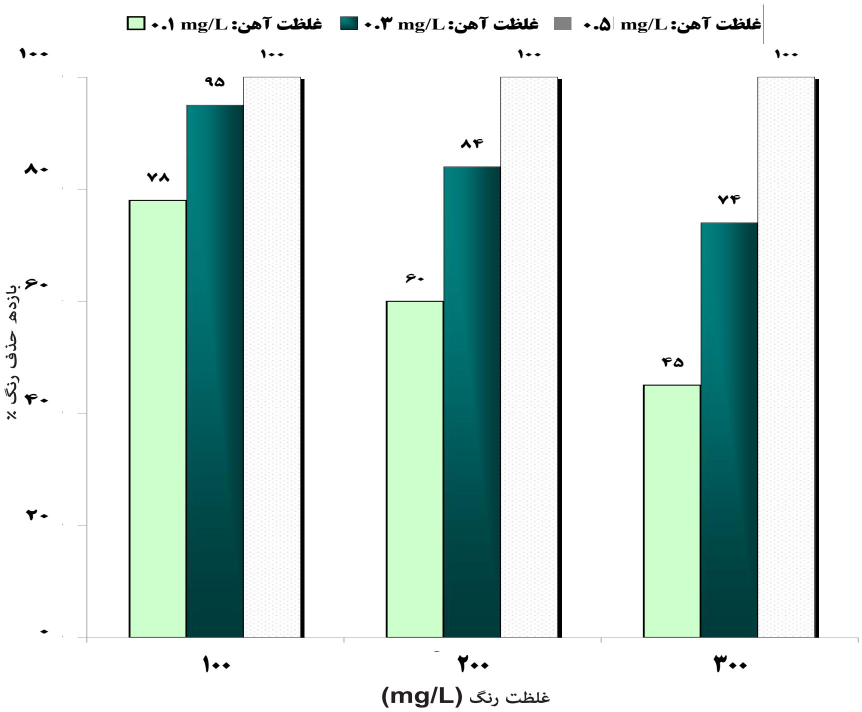
6 cm


غلظت آهن: ۰.۱ mg/L
غلظت آهن: ۰.۳ mg/L
غلظت آهن: ۰.۵ mg/L
بازده حذف رنگ ٪
۰
۲۰
۴۰
۶۰
۸۰
۱۰۰
۷۸
۹۵
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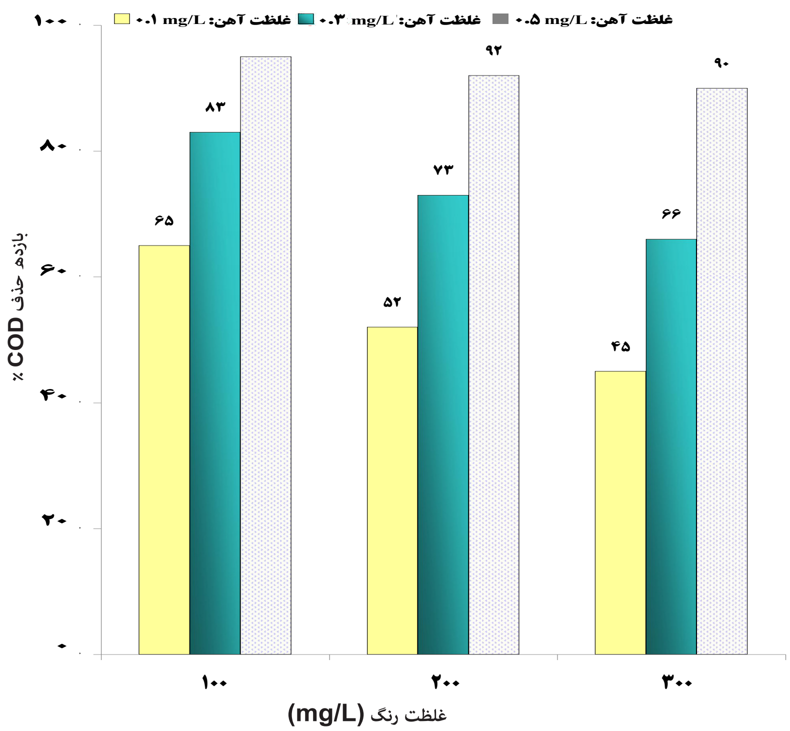
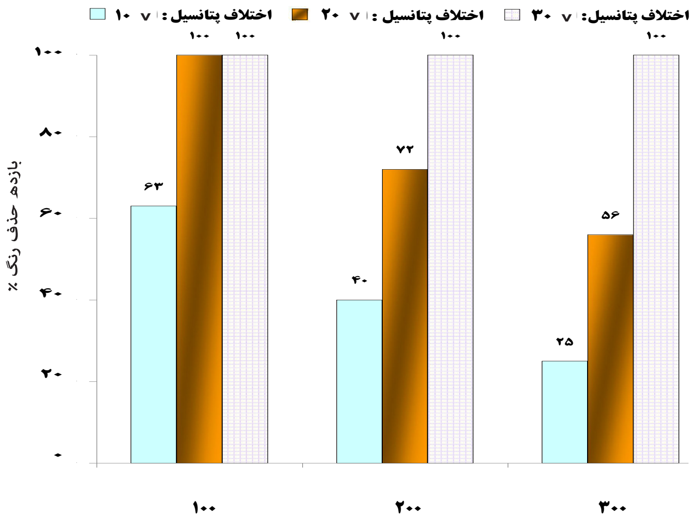
۲۰۰
۳۰۰
غلظت رنگ (mg/L)

[illegible]



[illegible] COD

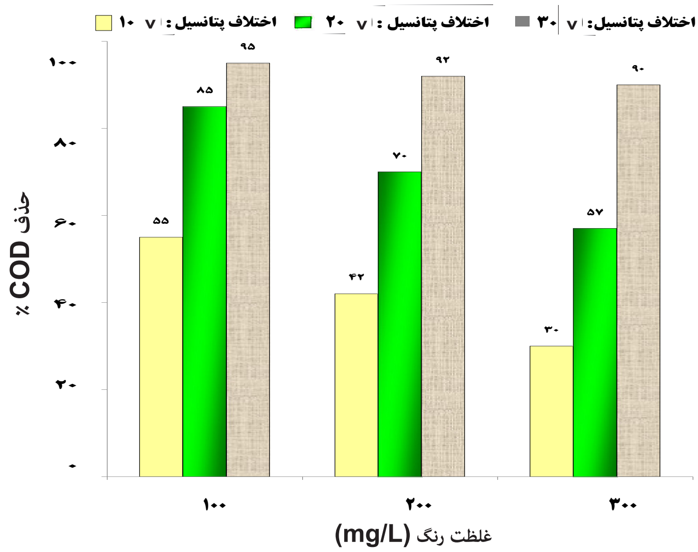
([illegible] mg/L [illegible] pH [illegible] min [illegible])



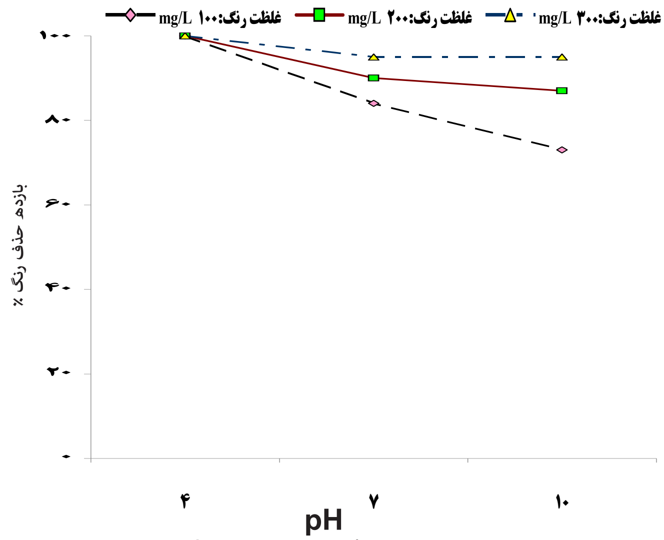
ŪǇ Ùzf ÆǂƷǨŧ ƐǕ ğŇǪƽ ţǨǬƥ ƐǾƥǨơ :hǨĞǁ
(Ĥġġ ƥ ĥġġ ǗĦġġ mg/L ŪǇ ǻǨǵƠǒǪǓ ƥ ġ/Ĩ **mg/L** ǰ ǵǻ ǻǨǵǮŇǂ ƠǒǪǓ ¡pH=ħ ¡ ¡ĩġ min ǮǨǪǫ : ǀ ǂǨǪǫǻ ŋǂƐǁ)

ŭǰ ǵǻ ǻǨǵǮŇǂ ƠǒǪǓ ǀ ǂȝǂ ǨǕ Ǵŧ ƳƳ ǮǨǂǁ ǴǖǨǩǪ ƨǂǨǪ ƥ ŪǇ Ùzf ǮǂǮǾǪ COD ƥ ŪǇ Ùzf ǮǂǮǾǪ ǀ ǂȝǂ ǨǕ ǰ ǾǚšǪġ .ƴǨǂƨǪ ǀ ǂȝǂ ǨǕ ǰǵǻ ǻǨǵǮŇǂ ƠǨǵ ƠǒǪǓ ƷƳ ƥ ŪǇ ƠǒǪǓ ƴǾǂƐǒ ÆǂƷǨŧ ƠǒǪǓ ƷƳ ƴǂƳǫū ǸƴǨǂǁǫ ǴǖǨǩǪ ǰǂ ƷƳ .ƴǨǂƨǪ ǀ ǨŧǮŇǂ Ùzf ǮǂǮǾǪ ǗƓǾǾǨ ŋǂƐǁ ƠƮǨ ƥ ġ/Ħ mg/L ǰ ǵǻ ǻǨǵǮŇǂ ǰ ǵǻ ǻǨǵǮŇǂ ġ/Ħ mg/L ƠǒǪǓ ƷƳ .Ơƽǂ ǰǾǂǨCOD ƥ ŪǇ ǗĕĩĦ ƥ ŪǇĕĨĨ Ùzf Ǘ Ĥġġ mg/L ŪǇ ǻǨƠǒǪǓ ƷƳ ƥ ƥ ĩħ Ùzf ǮǾǁ ĥġġ ƥ Ħġġ mg/L ŪǇ ƠǒǪǓ ƷƳ ƥ COD ǀ ǂȝǂ ǨǕ .ƴǾǻ ƠƽƳ ǴǕ COD ،ĕĩĩƥ Ĩħ Ùzf ƥ ŪǇ ĕĨħ

ƥ ŪǇ Ùzf ƐŧǂƴƭǨ Ǘġ/Ĩ mg/Lǩ ǰ ǵǻ ǻǨǵǮŇǂ ƠǒǪǓ COD ƐǕƐǕ ĤǵǂƐǨ ĕ .ƴǁ
ÆǂǨǾǮǾǁ ƥƐǪǓǨ ğŇǪƽ ţǨǬƥ ƐǾƥǨơ
COD ƥ ŪǇ Ùzf ÆǂƷǨŧ ƐǕ ğŇǪƽ ţǨǬƥ ƐǾƥǨơ ĨƥĦ ǨŪǁ ġ/Ĩ mg/L ǰ ǵǻ ǻǨǵǮŇǂ ƠǒǪǓ ǗpH=ħ ¡ĩġ min ǮǨǪǫ ƷƳ .ƴġƳƐǂǪ ǮǨǂǁ Ǉ Ħġġ ƥ ĥġġ ¡Ĥġġ mg/L ŪǇ ǻǨƠǒǪǓ ƥ ǗǨǾƽǨǨǼ ÙÊǪƠǂ ǀ ǂȝǂ ǨǕ ǗƳǂǁƐǪ ƴƴǨǂǁ Ǵŧ ƷŇǍǮǨǮǻ ƷƳ .ƴǨǂƨǪ ǀ ǂȝǂ ǻƐǾūǪǂŝ ǮǂǮǾǪ ǴǕ ŪǇ Ùzf ǮǂǮǾǪ ǻǨƠǒǪǓ ƐǂǪƴǨŧ Šǻġ ǻǂƐǕ Ǘ(Ĥġ V) ǰǾǂǨŗ ǨǾƽǨǨǼ ÙÊǪƠǂ



COD Ùzf ÆǂƷǨŧ ƐǕ ğŇǪƽ ţǨǬƥ ƐǾƥǨơ :Ĩ ǨĞǁ
(Ĥġġ ƥ ĥġġ Ǘ Ħġġ mg/L ŪǇ ǻǨƠǒǪǓ ƥġ/Ĩ **mg/L** ǰ ǵǻ ǻǨǵǮŇǂ ƠǒǪǓ ¡pH=ħ ¡ ¡ĩġ min ǮǨǪǫ : ǀ ǂǨǪǫǻ ŋǂƐǁ)



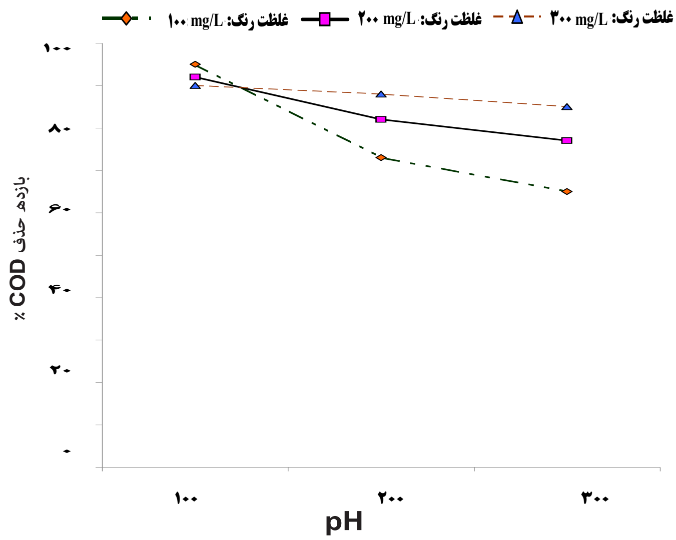
[illegible] pH [illegible]
([illegible] min [illegible] mg/L [illegible] mg/L [illegible])

[illegible] COD [illegible] mg/L [illegible] COD [illegible] COD [illegible] COD [illegible]

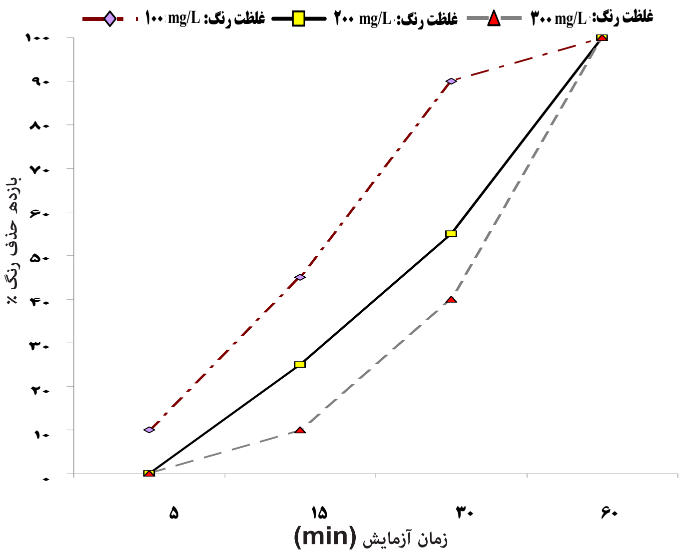
pH [illegible]

[illegible] pH [illegible] COD [illegible] min [illegible] mg/L [illegible] mg/L [illegible] mg/L [illegible]

[illegible] pH [illegible] COD [illegible] pH [illegible] pH=[illegible] pH [illegible] COD [illegible] pH [illegible] pH [illegible]



[illegible] pH [illegible] COD
([illegible] min [illegible] pH=[illegible] **mg/L** [illegible] mg/L [illegible])



ŪƖʒ Ùzf ÆǂʒǨ Ƹƛ Ɩ ŀgŀþ ʒĶǭƹ ƸǿþĶơ :ī ĶĞǁ
(Ĥġġ þ ĥġġ ŰĤġġ mg/L ŪƖʒ åĶġƠǒǭŬ þ ġ/Ĩ mg/L ǰġǡ åĶġʒǸǂ ƠǒǭŬ ¡Ĥġ vĶǿɕǁĶǐ ŬÊǐƠł ¡pH=ħ : Ɩ ǂĶǭƹǡ njǂƸǁ)

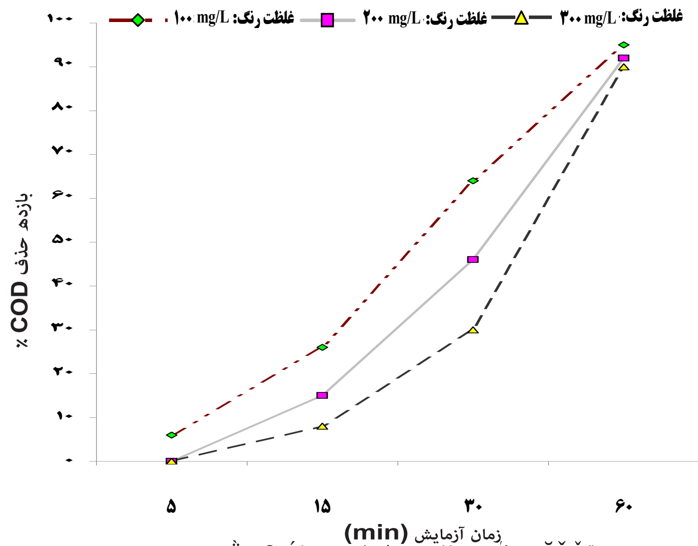
ǀ ŀŧŀþ ʒĶǭƹ ƸǿþĶơ

ĶŪǁ ī þ Ĩ ĶĔǁĶũ ǁ ƸƛƛŀĪþ ʒĶǭƹ ƸǿþĶơ Ɩ COD þ ŪƖʒ Ùzf ÆǂʒĶŧ ƸƛǀŀŧŀþʒĶǭƹ ƸǿþĶơ ī þ ĨĶŨǁ ǰġǡ åĶġʒǸǂ ƠǒǭŬ ŰĤġ V Ķǿɕǁǐ ŬÊǐƠł ŰpH=ħ ʒY Ɩʒ Ĥġġ þ ĥġġ ¡ Ĥġġ mg/LŪƖʒ åĶġƠǒǭŬ þ ġ/Ĩ mg/L ÆǂʒĶŧ Ű Ɩ ŀŧŀþ ʒĶǭƹ Ɩ ǂłʒǝł Ķƛ Ű ƻĶƽł ǰǂ Ƹƛ .yğYÆǭ ʒĶǂǁ ʒY ŰYǸǁÆǭ ǅyğĶǂǭ Ǵŧ ʒǸǍ ʒĶʒġ .yĶǂÆǭ Ɩ ǂłʒǝł yǁǂƸǝ ǰǿǂĶŕ ʒĶǿɕƛ ŪƖʒ Ùzf ʒłʒǿǭ ĤĨ min ƹł ƸǐʒŧåĶġʒĶǭƹ åĶġğĶŨǂYƖʒ ƸǐǂǿƘ yǿĶǸơ ǴƗǿǐ ʒY þ ʒĶǭƹ Ơǁzū Ķƛ Ķǭł Ơƽł Ɩ ǂłʒǝł åƸǿūǬǂš ʒǸǍ Ǵƛ ŪƖʒ Ùzf ʒłʒǿǭ ŰĶǿɕŧþʒyǿġ Ơǁzū ƹł yůƛ Ɩ ǂĶǭƹǡ ƟèĶf ƸǐǂǿƘ ʒY Ǵŧ åʒǸǍ Ǵƛ ŰyĶǂÆǭ

ʒĶǭyǁʒ ĕ Ĩġ Ķơ ŰŪƖʒ ǔ ǐǐŪǭ åĶġƠǒǭŬ ʒY þ Ĥġ min ʒĶǭƹ njǂƸǁ ʒY þ īġ min ʒĶǭƹ ʒĶǂĶǐ ʒY þ yǂǡÆǭ ƠƽY Ǵƛ Ùzf .yǂǡÆǭ ƠƽY ǴƛCOD þ ŪƖʒ Ùzf ƸŧłyƑ ŰyǁǂƸǝ ǴƗǿǀƛ ʒY ʒĶɕŪǂ Ùzf ǅYƹĶƛ Ǵƛ ʒyǿƽʒ åłƸƛ Ǵŧ yǁ ǅyğĶǂǭ ǰǿŧšǬġ .yĶǂÆǭ Ɩ ǂłʒǝł ƹĶǿǁ YʒǸǭ ʒĶǭƹ ŰŪƖʒ ǔ ǐǐŪǭ åĶġƠǒǭŬ

þƮƛ

RB19 ŪƖʒ åþĶf ƙÊǉĶǝ ÆǂĶǿʒǿǁþƸǐŬǂ ʒǸǿƽłyǿɕł Ǵƛ Ɩ ǂĶǭƹǡ ǔ ǐǐŪǭ njǂƸǁ ƠƮơ ʒǸǐǂǝþƸǐŬǂ yǁǂƸǝ ǴǿƽþǴƛ



COD Ùzf ÆǂʒĶŧ Ƹƛ Ɩ ŀŧŀþ ʒĶǭƹ ƸǿþĶơ :ĬĶĞǁ
(Ĥġġ þ ĥġġ ¡ mg/L Ĥġġ ŪƖʒ åĶġƠǒǭŬ þ ġ/mg/L Ĩ ǰġǡ åĶġʒǸǂ ƠǒǭŬ ¡Ĥġ vĶǿɕǁĶǐ ŬÊǐƠł ¡pH=: ħ Ɩ ǂĶǭƹǡ njǂƸǁ)

سلامت و محیط دوره پنجم/ شماره چهارم/ زمستان ۱۳۹۱
فصلنامه علمی پژوهشی انجمن علمی بهداشت محیط ایران

[illegible]

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[illegible]

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Evaluation of Electro-Fenton Process Performance for COD and Reactive Blue 19 Removal from Aqueous Solution

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ABSTRACT

Background and Objectives: Synthetic dyes represent one of the largest groups of pollutants in wastewater of dying industries. Discharging these wastewaters into receiving streams not only affects the aesthetic but also reduces photosynthetic activity. Electrochemical advanced oxidation processes such as Electro-Fenton process are low operational and have high mineralization degree of pollutants. In this study, we investigated affective factors in this process to determine the optimum conditions for dye and COD removal from aqueous solutions containing Reactive Blue 19 dye.

Materials and Methods: Synthetic samples containing Reactive Blue 19 dye were prepared by dissolving dye powder in double distilled water. and the the solution prepared was transferred into pilot electrochemical cell having two anode and cathode electrode made of iron and carbon. Electro-Fenton process was began by adding of Fe^{2+} ions and establishing electrical potential difference. After testing and at specified time intervals, each sample was collected from the pilot cell, and process performance was evaluated through measuring dye concentration and COD.

Results: Based on the results obtained, optimum conditions of Electro-Fenton process for dye and COD removal was determined. Accordingly, potential difference of 20 volt for dye concentration up to 100 mg/L and potential difference of 30 volt for dye concentration of more than 200 mg/L, reaction time 60 minutes, 0.5 mg/L of Fe^{2+} concentration and suitable pH for the maximum dye removal efficiency equaled 4 respectively. Under such conditions, the dye and COD removal was 100 and 95% respectively.

Conclusion: Based on the results obtained, it was revealed that Electro-Fenton process has significant ability in not only dye removal but also in COD removal. Accordingly, it was found that the effective parameters in Electro-Fenton process for removal Reactive Blue19 dye are electric potential difference, concentration of iron ions and electrolysis time.

Keywords: Electro-Fenton process, Avanced oxidation, Reactive Blue19 dye, Electrical Potential difference

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