





$Fe^{2+} = \frac{A}{\epsilon \cdot d}$  mmol/L)  $Fe^{2+} / H_2O_2 = \frac{A}{\epsilon \cdot d}$

ppm

pH

$Fe^{2+}$

mmol  $H_2O_2$   $\frac{A}{\epsilon \cdot d}$  mmol  $\frac{A}{\epsilon \cdot d}$

"  $\frac{A}{\epsilon \cdot d}$  mmol

(CECIL-model 7100) vis-uv

"  $\hat{i}$  nm

"

4500-E - CN

(

" Merck

" Excel

$Fe^{2+} / H_2O_2$  pH

pH

pH =

"  $\hat{i}$  pH =  $\hat{i}$

pH

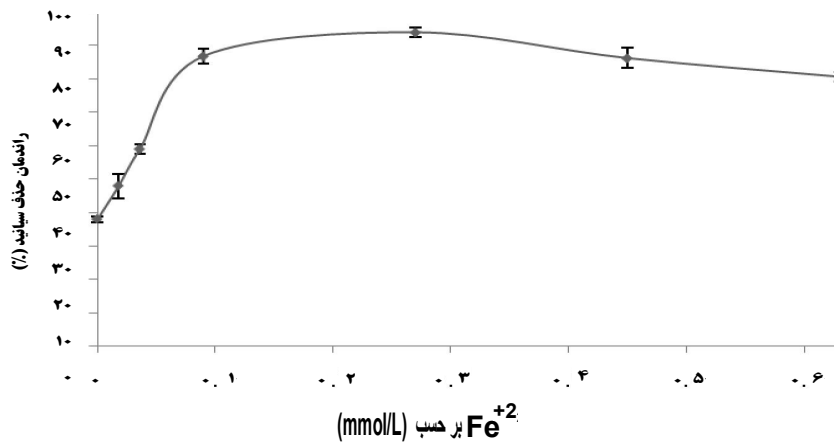
pH  $\hat{i}$  pH =

pH

pH =

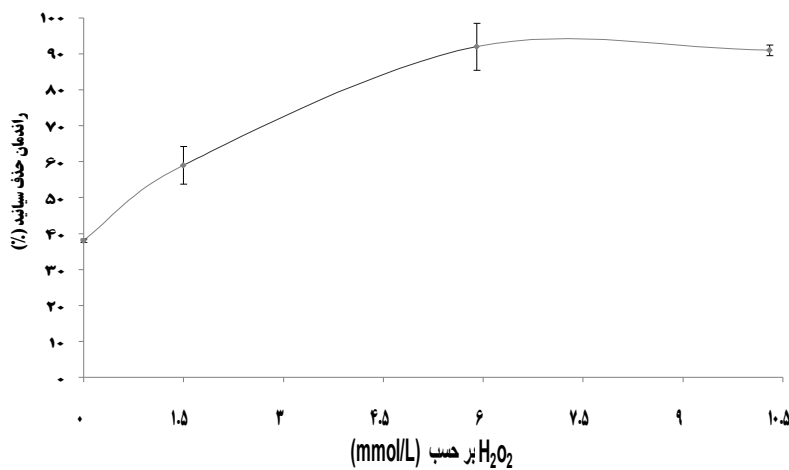
" !  $\hat{i}$  N





(راندمان حذف سیانید (%))  
 (mmol/L) بر حسب  $Fe^{+2}$   
 (H<sub>2</sub>O<sub>2</sub> = / mmol/L | pH = | min | mmol )

در این مطالعه، درصد حذف یون آهن (Fe<sup>2+</sup>) با تغییر غلظت H<sub>2</sub>O<sub>2</sub> و pH بررسی شد. نتایج نشان داد که درصد حذف آهن با افزایش غلظت H<sub>2</sub>O<sub>2</sub> تا حدی افزایش می‌یابد و پس از آن کاهش می‌یابد. همچنین، تغییر pH نیز بر درصد حذف آهن تأثیر دارد. در شرایط بهینه، درصد حذف آهن به بیش از 90٪ رسید.



(راندمان حذف سیانید (%))  
 (mmol/L) بر حسب H<sub>2</sub>O<sub>2</sub>  
 (Fe<sup>2+</sup> = / mM/L | pH = | min | mmol )



ی/ی ی فل )ی/ ( )ی/ی ( )ی/ ( )ی/ ی/ ی/ ( )ی/

" Fe<sup>2+</sup> /H<sub>2</sub>O<sub>2</sub> < . . . . .  
i ymin . . . . .

ñ y . . . . .

yy . . . . . Lipczynska  
"fl ) . . . . .

Kavitha . . . . .  
y/ mmol . . . . .

fl . . . . . L  
( L . . . . . ymin . . . . .

" . . . . . H<sub>2</sub>O<sub>2</sub> . . . . .  
ç/ . . . . .

ñ ç ðé ç/ mM  
" H<sub>2</sub>O<sub>2</sub> :CN . . . . .

mmol/L . . . . . (H<sub>2</sub>O<sub>2</sub>:CN) = . . . . .  
è mg/L . . . . . çmin . . . . . (Fe<sup>2+</sup>L . . . . . y/

Masahafi . . . . .  
(H<sub>2</sub>O<sub>2</sub>:CN) = . . . . .

mg/L . . . . . èçmin . . . . . éç mg/L  
(é L . . . . .

= y/ mmol/L ipH= . . . . . ç/ mmol/L  
"ffFe<sup>2+</sup> / H<sub>2</sub>O<sub>2</sub>= y/ y/ ) H<sub>2</sub>O<sub>2</sub> = / mmol/L iFe<sup>2+</sup>

ñ . . . . . çmin . . . . .  
" . . . . .

ç/ mmol . . . . .  
ñ ç ðé ç/ . . . . .

Fe<sup>2+</sup> . . . . . pH = . . . . . L pH  
"fl L . . . . .

pH . . . . .  
( L . . . . .

Fe<sup>2+</sup> . . . . . pH . . . . .  
OH<sup>0</sup> H<sup>+</sup> . . . . . H<sub>2</sub>O<sub>2</sub> . . . . .

"fl L . . . . . OH<sup>0</sup>  
. . . . .

Fe<sup>2+</sup> / H<sub>2</sub>O<sub>2</sub> = y/ y/ . . . . .

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

( . . . . . L . . . . .  
Fe<sup>2+</sup> + H<sub>2</sub>O<sub>2</sub> → Fe<sup>3+</sup> + OH<sup>0</sup> + OH<sup>-</sup> . . . . . ( )

Ly/ y . . . . . Fe<sup>2+</sup> /H<sub>2</sub>O<sub>2</sub> . . . . .  
" . . . . . fl . . . . .

: ( L . . . . .

Fe<sup>2+</sup> + OH<sup>0</sup> → Fe<sup>3+</sup> + OH<sup>-</sup> . . . . . ( )

Fe<sup>2+</sup> /H<sub>2</sub>O<sub>2</sub> < . . . . . Neyens . . . . .

y/ mmolL . . . . .  
. . . . . "fl L fl . . . . .

" y/ mmol . . . . .

Fe<sup>2+</sup> /H<sub>2</sub>O<sub>2</sub> . . . . . y/ . . . . . / mmol/L  
. . . . . y/ y/

H<sub>2</sub>O<sub>2</sub> . . . . .  
( L . . . . .

2H<sub>2</sub>O<sub>2</sub> → 2H<sub>2</sub>O + O<sub>2</sub> . . . . . ( )

H<sub>2</sub>O<sub>2</sub> + OH<sup>0</sup> → H<sub>2</sub>O + HO<sub>2</sub><sup>0</sup> . . . . . ( )  
. . . . . Fe<sup>2+</sup> /H<sub>2</sub>O<sub>2</sub> . . . . .





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## **The Study of Fenton Performance in Removal of Cyanide from Aqueous Solution**

Somayeh Golbaz<sup>1</sup>, \*Ahmad Jonidi Jafari<sup>2</sup>, Roshanak Rezaei Kalantari<sup>3</sup>

<sup>1</sup>Department of Environmental Health, Faculty of Health, Alborz University of Medical Sciences, Alborz, Iran

<sup>2</sup>Department of Environmental health Engineering, School of Medical Sciences, Tarbiat Modares University, Tehran, Iran

<sup>3</sup>Department of Environmental Health, Faculty of Health, Tehran University of Medical Sciences, Tehran, Iran

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### **ABSTRACT**

**Background and Objectives:** Cyanide is a toxic pollutant existing in the various industrial effluents such as iron and steel, coal mining, non-ferrous metals manufacturing and metal plating. Its presence in water resources and wastewater, as serious hazardous substances leads to undesirable effects on both the environment and human. Thus, its concentration control is essential for human health. The main goal of this study was to evaluate Fenton process efficiency in cyanide removal from aqueous solution.

**Materials and Methods:** This is an experimental study Conducted at Lab scale in a batch system. We investigated effect of different variables including; pH, mole ratio of  $\text{Fe}^{2+}/\text{H}_2\text{O}_2$ , contact time, and initial concentration of cyanide. Data were analyzed using Excel software.

**Results:** We found that cyanide with initial concentrations of 0.4 mM/L was reduced by 92 %. This removal result was related to oxidizing agent of hydroxyl radicals under optimum conditions including; pH = 4, molar ratio  $\text{Fe}^{2+}/\text{H}_2\text{O}_2 = 0.046$  ( $\text{Fe}^{2+} = 0.27$  mM/L) after 60 min reaction time. An increase in reaction time was not improved cyanide removal efficiency. Moreover, the Fenton process efficiency in cyanide removal decreased from 92 to 60 %, by increasing the initial cyanide concentration from 0.4 to 0.6 mM/L.

**Conclusion:** It can be concluded that Fenton oxidation Process can be considered as a suitable alternative for cyanide removal to achieve environmental standards.

**Keywords:** Advanced oxidation, Hydrogen peroxide, Fenton, Wastewater treatment, Cyanide

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\*Corresponding Author: [a.jonidi@modares.ac.ir](mailto:a.jonidi@modares.ac.ir)

Tel: +98 21 883563 Fax: +98 21 82883825