[illegible]

[illegible]

[illegible]

[illegible] a.jonidi@modares.ac.ir

[illegible]

چکیده

[illegible]

[illegible] Fe^{2+} $/H_2O_2$ [illegible] pH [illegible]

[illegible] Excel [illegible]

[illegible] mmol/L [illegible] $pH=$ [illegible] H_2O_2 [illegible] Fe^{2+} [illegible] mmol/L [illegible] $(Fe^{2+} =$ [illegible] mmol/L$)$ [illegible] mmol/L [illegible] mmol/L [illegible]

[illegible]

واژگان کلیدی: [illegible]

[illegible]

ǫǨʅǁ Ǽǯǝ Ƿ ǼǨǻ ǾǨǁǿǂƸǴ ǻǷǨƒ ǻǨǵ ƙǨšř ǴǿǞǆǴ ǮY ǯǸǁǝ ǾǨǢǨǦǟǪ ǯǻ Ƹǂ ǨDžǨƒ ƨǽǨǁ Ǵǂ (ǞǝǊ-ǞǏǷǞǞ) ƠǝƗ ǴǁǝƸū YǂǸǪ Ǜƶƒ ƸǨ ǽǷƸǛ ǯǸǁǝ ǯǸǿǝƗǷǿšǂ ǷǽǂƸǝ ǛǷǁYY ǯǨǂǁ Ƿ (ǞǏ ǷǞǊ ,ǞǞ) Ǽǯǝ ƸDžǨǁ ǼƠƸǨ Ǜƶƒ ǮY Ǜ(Ǟħ) ǼǨǻ ƬǽţǸǨǸǿǨ ǷǽǂƸǝ Ƹǂ ǨǁǨ ǴǿǞǆǴ ǀ ǿř ǯǂǸǁǛ ǴǨ YǮǂǸǪ ǼƠƸǨ ǮY ƠǂƩ ǻǂǴǽǂū ǯǂǸǁǛ ǴǨ ǯǸǁǝ ǷǽǂƸǝ ǯǽƸǨǁǨ .ǷǁƗǵ ƸǷǸǪ (Ǟǁ) ǴūǨǨǪ ǯǽ Ƹǂ ǛǷǵ .YǷǮǼǪ ǮǨǯǁ ǴǨ ǼǯǝƸ ǻǨǵƙ ǨǾǨƒ ǴǿǞǆǴ ǯǿǿūǿ Ƿ ǷǿǨǿǝ Ǜƶƒ Ƹǂ ǯǸǁǝ ǯǸǿǝƗǷǿšǂ ǷǽǂƸǝ ǼǽǮǨţ ǼƏǮƸǂ ǯǨǂ ǛFe[2+] /H_2O_2 ǼǨǸǪ ƠǁƗǁ ،pH) ǜ ǪǁǛǪ ǻǨǵƸǪǁǮǨř ƸǾ .ƠƗǁ Ƹǂ (ǷǿǨǿǝ ǴǿǞǂ ƠǽǪǛ ƸǿǨǸ Ǜ Ʀ ǨǯǷ

ǨǵǷ ǷǮ Ƿ YǂǸǪ

YǂǸǪ

Ǜ(ǜǻ) ǯţǷǮǷǿǵ ǷǾƗǂƸř ǛǪǿǝǨř ǷǿǨǿǝ ǼǨǽǨǯǿǁ YǂǸǪ . ǜ ǨǂǛ ǯ ǽǷǨǸǨř ǛYǸǝ Ƿ (ǜǜ) ƬǽǮǸǞǨǸǝ ǷǿǞ ǛǴǻ Ǡ ǯ ǵǨ ǾǨǞǨǸǝ ǼǵǨǛ ǂ ǽǨǪǨ ! ǸǪƠ ǴƩǮY ǨǨ ǾǨǁǞ ƸǽǨ ǛǷǿǞ ǤǽǮǸǷǿ ǼǨǮǨǨ .ǷǁǷǁ ǴǿǞǿ ǯǨǯǨǻ Merck ƠƗƸǁ Ƹǂ

ǮǨǗ ǷǷǮ

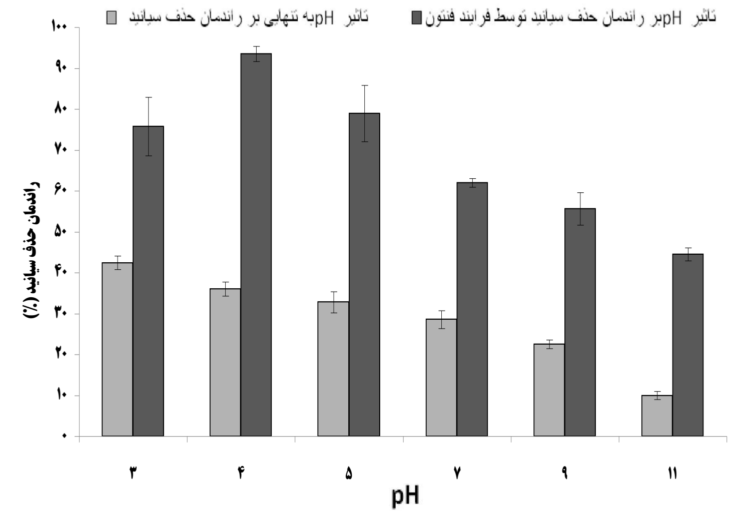
Ǜƶƒ ǮǸǿǪ ǴǨ Ǵǂ ƠǝǞ ǻYƸǮǨǂ ǼǨƸʅǿ ǴūǨǨǪ Ƭǽ ǞǼǿƟǿ ǯǽ Ƿ ǼǵǨǛǂǽǨǪƸǻ Ʀ ǨǿǞǪ ǮY Ƿ Ǽƒ ƒǂƸǍ ǯǸǁǝ ǷǽǂƸǝ Ƹǂ ǛYǨǞǁǞ ǨǨ ǷǿǨǿǝ ǯǸǿǝƗǷǿšǂ ǷǽǂƸǝ ǫǨʅǁ ǼǍ ǮY .ǷǁǷ ǫǨʅǁ ǴǁšǨ ǪǁšǿǝƠǮǸDž ǴǨ ǷǿǞǽ Ǜ Ʀ ǨǯǷ ǯǨǪǿ ǛFe[2+] /H_2O_2 ǼǨǸǪ ƠǁƗǁ ¡pH ƸǞ ǯǸǁǝ ǼǨǻ ǸǿǜǪ Ƹǂ ǛǷǽǂǞǻ ǯǽ Ǜƶƒ ǯǨǪǷǁǮ ƸǨ ǛǷǿǨǿǝ ǴǿǞǿ ƠǝǪǛ ǴǨ ǜ ǪǁǛǪ ǜǽǨDž ƙǨǂǵǨ ǮY ǷǿǨǿǝ .ƠƸū ǮǨƸǁ ǴūǨǨǪ YǮǸǪ ǴƬǁǨš .(Ǒ) YǮǁY YǸƩǷ (ƠǝǁǞDž ǛǸǁ ǴǨ ǴǪšǨ) ǜ ǪǁǛǪ ǻǨǵǯǁǂǴǪ YǸƩǷ ħ-ǞǏ mg/L ǯǂǴǪǪ ǴǨ Ǥǵ ǷǿǸǷ ǾǨʅǁƠǮǨǾ ƙǨšř ǮY ǑǷmg /LǴǿǞǂ ƠǝǪǛ Ƹǂ ƸǨǂǨƒ ǴūǨǨǪ ǮY ǯǨǁƸǨǨǨ .(ǑǜǏ) YǮǁY ǻǨǵƸǂǨ Ƹǂ ƬǽǂǨǪǸǻ ǫǨʅǁ ƠǝƩ .ǷǁǷ ǷǿǨǿǞǪǁǂ (ǁ/ħ mmol/L) ǷǿǨǿǞǪǁǂ ǫǸǿǝǪǸǨ ǨǨǸ ǿǿǨǗǨ ǷǁǷ ǷǁǨǽǸǿ ǻǨǴǂǿǂǿ Ǟ/Ǐ L ǻǷǨƒ ǴǪǪǪǿǁ ƙǨǂǵǨ ƸǂǞ L ǪǁǛ Ǵǂ ǾǮǸDž ǯǨǷǨ .ǷǨǁƸū Ƿ ǪǿǁǨǾř ǷǿǨǿǝ ǂ ǿǂƸǷ Ƹǂ ǵ/ħ mmol ƠǝǪǛ ǨǨ ǷǿǨǿǝ ǯǸǨ pH ǛǴǿǞǁ pH ǯǿǿūǿ ƠǝƩ ƸǞǝ .ǷǁǷ ǴǿǞǷ ǪǨǷǝ ǷǿǞǷǮǷǿǵ ǪǨǷǝ ǷǿǞǷǮǷǿǵ Ƿ ƬǽǮǸǞǨǸǝǷǿǞ ǷǿǵǸǷ ǂ ǿǂƸǷ ǴǨ ǵǸǪǛǪ YǮǸǪ ƸǨǿǨǗǪ ƸǞǝ .ǷǁǷ ǪǿǞǸǷ Ǟ-ǞǞ ǯǿǨ ǷǿǷǷǛǪ ǮY ǵ/Ǐ ǷǞN

ǷǸǁšǨ ǨǨ ǯǝǷǮǷǿǵ ǷǿǞǿǸǿƸř Ƿ ǴǨǻ ƠǞǵ (II) ǯǵǻ ǾǨǁǿǂǸǝ ƸǞǁ ǵǸǪǛǪ ǴǨ (Fe[2+] = ǵ/ǞǏ mmol/L) Fe[2+] /H_2O_2 =ǵ/ǵħǏ ǼǨǸǪ ǞǵǵrpmƠǛƸǝ ǨǨ ǼšǷǨǨǨǨǪ ǯǵǯǵ ǻǷǮ ƸǨ ǮǸǪǿǨǮ Ƿ ǷǷǁǁ ǴǨǨǁǂ ǷǿǞǷǮǷǿǵ ǨǨ Ǜ ǀ ǷǿǷ ǯǨǪǿ ǫǨǯǞ Ƹǂ ƙ ř ǴǸǯǁ pH .ǷǁǷ ǷǁǿǁǿǮǂƸǻ ǀ ǅǷǿ ƠǝƩ ǨǵǴǸǯǁ ƙ Ś Ƿ ǷǷǁǨǿǮ ǞǞ/Ǐ -ǞǞ/ħ ǴǨ ǪǨǷǝ Ƹǂ ǷǿǨǁǿǂ ǨǨ ǻǷǛǨ ǻǨǵƸǨǿǨ ǮY ǂ ǷǿƸǷ ǯǷǵ ǴǨ .ǷǁǷǁ ǷǿǨǪǷ ǷǿǨǿǝ ǮY Fe[2+] ƸǷǿǨǷ Ǜ(one factor at a time) ǯǨǪƸ ǮY ƸǪǁǮǨř Ƭǽ Ƿ ǷǮ mmol ǻǨǵƠǝǪǛ ǮY H_2O_2 ¡ǵ/ǵǞǏ-ǵ/ǏǞmmol ǻǨǵƠǝǪǛ ǷǿǨǿǝ ǴǿǞǂ ƠǝǪǛ ƸǷǿǨǷ Ǜ(Ǟǵ- ǏǵǷmin) Ʀ ǨǯǷ ǯǨǪƸ Ǜ(Ǒ/Ǐ -Ǒǁ/Ǟ ǻǂƸǨ .ǷǁǷ ǼǝǮƸǨ ǷǿǨǿǝ Ǜƶƒ ǯǨǪǷǁǮ ƸǨ Ǜ(ǵ/ħ- ǵ/Ǐ mmol) ǨǨǪǁǷ ǼʅǁǝǛǁǮ Ƿ ǷǮ Ƹǂ ǛǷǁǨǪǼǻǨǨ ǷǿǨǿǝ ƠǝǪǛ ǀ ǅǷǿ ǵǸǍ ǮY (CECIL-model 7100) ǵǷǪ vis-uvƸǪǸǪǷƸǪǛŚǂ ǛǷǷǪǻ ƠǝY ǴǨ ƙ ƶƩ ƸǨYǨǨǪ .(Ǟǁ) ǷǁǷ ǷǿǨǪǝǂ ǏǜǛ nm ƧǸǪ ǷǿǨǿǝ ƠǝǪǛ Ƿ ǷǁǷ ǷǁǿǁǿǮǂƸǻ ǷǿǨǿǝ ǯǸǿǝƸǴǿǨǨ ǼǨǪǨ ǮY ǞǨǨǪ ǷǿǨǿǝ ǀ ǅǷǿ ǾǨǨǨǪǸǨ ǴǿǪǨ .ǷǨYƸū ǴǁǝǨǪ ǴǸǯǁ ƸǵǾǨǨǪǸǨ ǷǪǮǮǷǁǨǝǂ ƙǨǨ 4500-E - CN ǀ ǨǪǸǨ Ƿ ǷǮ ǪǁǨ Ǵǂ ƠǝǂƸǂǮ ǴǨ ǫƸǜ .(Ǟǁ) ǷǁǷ ǫǨʅǁ ƙǨǂǵǨ Ƿ ƙǨ ǛƠǨY ǯǨǮ ǜǨǮ Ƿ ǨǨǑ ǀ ǵǨǵ ƠǝƩ Ƿ YǸǨ ǞǏ ǨǨ ƸǨǨƸǨ ǨǵǴǸǯǁ ǨǵǷYǿY Ƹǂ ƠǨǞǁ ǮY Ƿ ǷǁǷ ǮǂƸǵǷ ǮǨǨ ǞǨǂǷƒ ǾǨǨǨǪǸǨ ǮǂǮǨǪƸǁ Ƹǂ ǨǵǷYǿY ǨǷǪǛǷ Ƿ ǴǨǯǁǷ ƠǝƩ .ǷǁǷ ǴǪǮƸū ǯǷǛǨǷǪ ǮǨǨ .ǷǁǷ ǷǿǨǪǝǂ Excel

ǨǵǴǪǮǨǨ

.Ǟ ƸǷǿǨǷ Ƿ ǷǿǨǿǝ Ǜƶƒ ǯǨǪǷǁǮ ƸǨ ǼǨǨǁǷǷ ǴǨ **pH** ƸǷǿǨǷ ǯǵ ǮY ǷǽǂƸǝ ǯǸǿǝƗǷǿšǂ ǯǸǁǝ

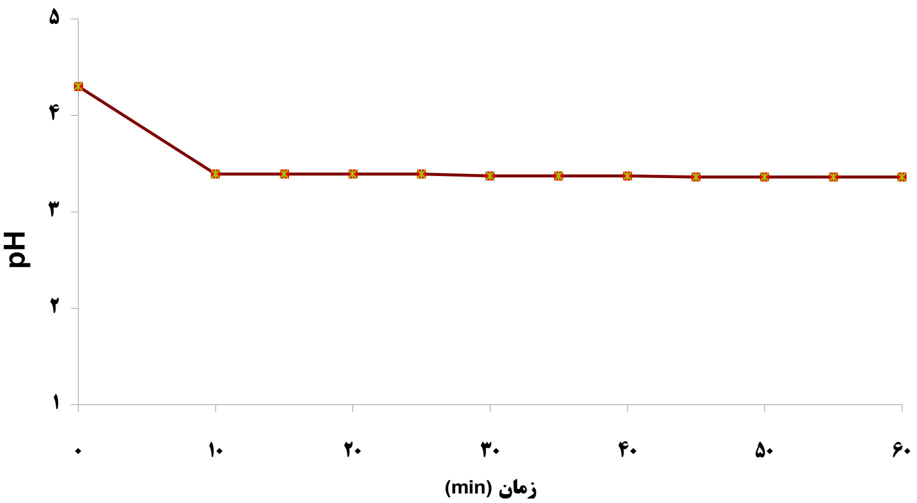
Ǵǂ YǂY ǯǨǂǁ ǷǿǨǿǝ Ǜƶƒ ƸǨ ǼǨǨǁǷǷ ǴǨ pH ƸǷǿǨǷ ǾǨǂǨǪƸǵ pH =ǁ ǮY ǂ ǷǿƸǷ ǴǨ ǷǿǨǿǝ Ǜƶƒ ǯǂǴǪǪ ǯǨƸǪǯǂ Ƿ ǯǨƸǪǂǿǨ ǼǨƸǨ Ƹǂ .(Ǟ ǨǗǁ) YǸǨ ǜǞǵ Ƹǂ ƸǪǯǂ pH =ǞǞǷ ǜǵǵYǨūǪ ǷǽǂƸǝ ƠǝƩ ǂ ǵǨǪ pH ǯǿǿūǿ ǻǂƸǨ ǴǿǞǂ ǾǨǂǨǪƸǵ ƨǨǪǁ ǯǨǪǷǁǮ ǯǨƸǷǜǨǨ ǂǪ YǂY ǯǨǂǁ ǞǨǗǁ ǮY ǯǸǁǝ ǯǸǿǝƗǷǿšǂ ǜǨǨ ǻǨǵ pH ǮY Ƿ YǸǨ ǜǏǞ ǵYǨūǪ pH =ħ ǮY ǷǿǨǿǝ Ǜƶƒ ǞǞ Ƹǂ ƸǷǜǨǨ ǻǨǵ pH ǮY ǴǬǨǨǨ .ƠǝǨǨ ǀ ǵǨǂ Ǜƶƒ ǯǨǪǷǁǮ DžǛǂ ǂ Ǫ Ǵǂ ǯǨǂ ǴǴƩǸǷ ǨǨ .ǷǁǷ ǪǂǮǨǨǨ ǷǿǨǿǝ Ǜƶƒ ǯǨǪǷǁǮ ǯǨǂ Ƹǂ ǛƠǝǂ pH=ħǮY ǷǿǨǿǝ Ǜƶƒ ǯǨǪǷǁǮ ǯǨƸǷǜǨǨ ǷǨYƸū



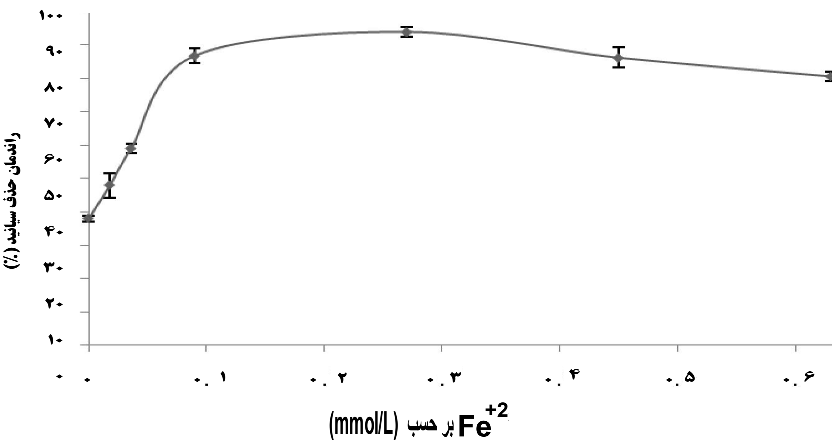
(ĕ) ǯŃ ǯŃĠǝłyĠʂ ŧł yĠłǫ ƷY ǯƌ ƹĠƙ ƿ yĠĸĠǝ Ǜƶƒ ǯƙǫyƷ ƹ ŮĠƙ Ǵ **pH** ƹĠƙ :ĤǨŨ‖
(**Fe^{2+}** = ġ/ĥĪ **mmol/L**) **Fe^{2+}/ H_2O_2** = ġ/ġħĩ ŮŃǫ Ơʂ ƿ ĩġ**min** ǀ łŧƿ ǯƙǫ ¡ġ/ħ **mmol**Ǵ ƹƷ yĸǝ Ǵƿł Ơǒǫ Ǚ)

.yƷYƹū ǳYǨĂǝł Ǩƒłƹǫ ǫǯ ƷY pH
ǜ ǫŨǫ ǻǵǯǫ ƹ ƸĂ ƷY ǯŃǝ yǝ pH Ɵłƹǔ ƸǝƹĂ ƹł
Ǵ ǯŃǝ ǀ łŧƿ ǫ ǧƿł Ĥġmin ƸĂ ƷY pH Ġŧ YłY ǯǨŧ‖
.yǨƸǫ ǀ ġŧ yƒƿ Ŧ ǳƹyƷ
yǝ Ǜƶƒ ǯƙǫyƷ ƹ **H_2O_2** ƿ **Fe^{2+}** Ơǒǫ Ǚ ƹƙ .ĥ
ǯŃǝ yǝƹǝ ǌǝŃ
yǝ Ǜƶƒ ǯƙǫyƷ ƹ H_2O_2ƿ Fe^{2+}Ơǒǫ Ǚ Ɵłƹǔ
ǳy‖ ǳYłY ǯǨŧ‖ ħ ƿ Ħ ǻǵǨŨ‖ ƷY ǯŃǝ yǝƹǝ ǌǝŃ
Ơǒǫ Ǚ ǀ ǝł Ůyǧ YƸǫ ǯǨŧ‖ Ħ ǨŨ‖ Ġŧ ƷŃĂ ǯǯġ .Ơǝł
Ơǫ Ơǒǫ Ǚ ƷY) ġ/ĥĪ mmol/L Ǵ ġ/ġĤĩ ƹł ƿƹǝ ǯŃ

Ǜƶƒ ƸǝƷŧ ǀ ǝł ł ƩŃǫ (pH =ħ ƿ H_2O_2 = Ĩ/Ĭ mmol/L
ƷY ěħĩ ƹł yǝ Ǜƶƒ Ġŧ ǻƷŃĂ Ǵ .YYƹūƸǫ yǝ
Ǵ (Fe^{2+} /H_2O_2 =ġ/ġġĦƸŃǫ Ơʂ) Fe^{2+} =ġ/ġĤĩ mM/L
=ġ/ġħĩƸŃǫ Ơʂ) Fe^{2+} =ġ/ġĥĪ mmol/L ƷY ěĬġ ƹł ǀ ǝ
ƸǝƷŧ ŮƷłyƸǫ ǰ ǝ ƹł ǰ ġƌ ǯŃ ǀ ǝł ƿ yʒƷƸǫ (Fe^{2+} /H_2O_2
Ġŧ yǧYƸǫ ǯǨŧ‖ ǝ ħ ǨŨ‖ .yǨƸǫ ǀ ġŧ Ƹǯŧ yǝ Ǜƶƒ
ǀ ǝł ŮpH =ħ ƿ Fe^{2+}=ġ/ġĥĪ mmol/L Ơǫ Ơǒǫ Ǚ ƷY
ł ƩŃǫ Ĩ/Ĭ mmol/L Ǵ Ĥ/Ĭmmol/Lƹł ǯƫƿƷyǧyʂŧƹ Ơǒǫ Ǚ
ƹł yǝ Ǜƶƒ Ġŧ ǻƷŃĂ Ǵ .YYƹūƸǫ yǝ Ǜƶƒ ƸǝƷŧ ǀ ǝł
/H_2O_2 =ġ/Ĥĩ ƸŃǫ Ơʂ) H_2O_2 =Ĥ/Ĩ mmol/L ƷY ěĩġ



ǜ ǫŨǫ ǚǵǯǫ ŮĂ ƷY ǯŃ yǝ **pH** Ɵłƹǔ :ĥǨŨ‖



(ĕ) ƿƩə ǯŇĠ ǜ ǫǬǕǭ ƩĠƳƘǽǭ ǮƳ ƴĠǨƘĠƨ Ǜƶƒ ǯƘǭƴǴǮ :Ħ ƘǕǁ

(H_2O_2 = Ĩ/Ĭ **mmol/L** ¡pH =ħ ¡ĩģ**min** ǀ ǃŧǂƿ ǯƘǭƩ ¡ģ/ħ **mmol**Ƙǁ ƩǂƩǁ ƴǨƘǿƨ ƓǿƘƿǂ ƠŏǭǬǓ)

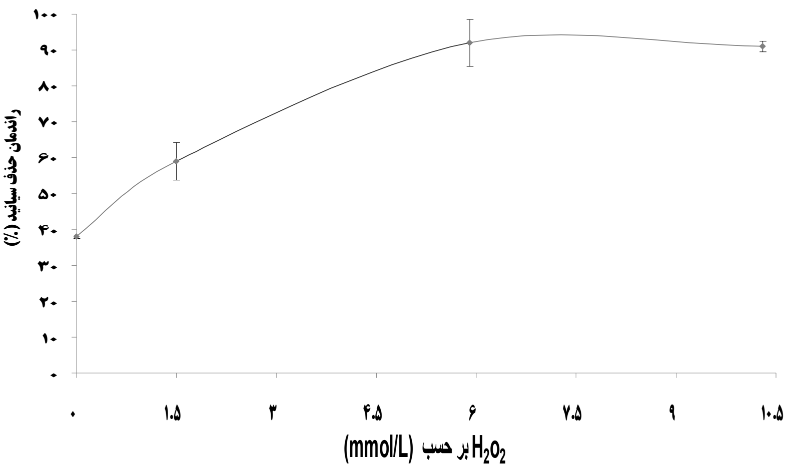
ǼǁŇǭ ƠǥŞǁ) H_2O_2 =Ĩ/Ĭmmol/L ǮƳ ĕĬģ ƩǂƩǬǂǿǁ Ɠǁ (Fe^{2+} ǛǮƚƴǼǭ ǰǽǀ ǀ ǽǂƺǝǂ Ƙǁ ǰǿǁšǬģ .ƴƨǮǼǭ (Fe^{2+}/H_2O_2 =ģ/ģħĩ .ƴƘǽǼǯǁ ǻǂǴǒƒÊǭ ƘǁƘǟ ǀ ģƘŧ ƴǨƘǿƨ Ǜƶƒ ǼǽǂǮƘŧ ƴǨƘǿƨ Ǜƶƒ ǯƘǭƴǴǮ Ʃǁ ƴǨƘǿƨ ƓǿƘƿǂ ƠŏǭǬǓ ƿ ǯƘǭƩ ƩǿƿƘǭ .Ħ ǯŇǬǝ ƴǽǂƩə ǌƨŇǭ

ǯƘǭƴǴǮ Ʃǁ ǫƴǽǂèə ƓǿƘƿǂ ƠŏǭǬǓ ƿ ǯƘǭƩ ƩǿƿƘǭ ǛĩƿĨ ǻƘģǕǁ ƩǂƘƊƒ ƓǁǿǿǁǁǌǂƩ ǮƳ ǯŇǬǝ ƴǽǂƩə ǌƨŇǭ ƴǨƘǿƨ Ǜƶƒ ƓǿƘƿǂ ƠŏǭǬǓ ƿ ĩģmin ǯƘǭƩ ǮƳ .ƴģƳǼǭ ǯƘǂǬǮ ƘǓǁ ƘƒǂƩǭ ģƳƘǛǭ Ǜƶƒ ǯƘǭƴǴǮ ǰǽƩǬǁǁ Ǜģ/ħ mmol/L Ƙǁ ƩǂƩǁ ƴǨƘǿƨ .ƴǁ ǫƴģƘǂǭ ĕĬħ

ƤƮǁ

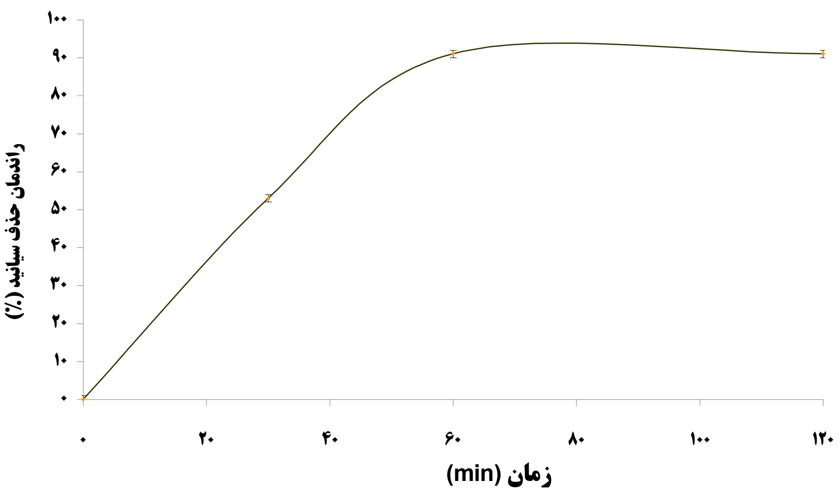
Ǜǰģǃ ƠŏǭǬǓ ǛpH ǯŇƮǯģ ǻƳƘǽƩ ƘǭǂŇǕ Ɠǁ ǯŇǬǝ ƴǽǂƩə ƠŏǭǬǓ Ǜ(ǰģǃ ǮƳŇř ǛƮǽƩə ƘǼ ƿƩə ǻƘģƮǯǁ) ǰģǃ ǕŇǁ ǯƘǭƩ ƿ ǰģǃ ǯŇǽ Ɠǁ ǯƫƿǮƴǿģƴǿǥǂƩř Ơǁǥǁ ǛǯƫƿǮƴǿģƴǿǥǂƩř ƓǂǿǿǁnjǽǂƩǁ ǛƠǥǽǮƿƩlj ǰǽǂƩǁǁǁ .(ĤĬ) ƳǮƚƳ ǼǓǬǥǁ ǀ ǃŧǂƿ .ƴǽǃ ƠƨƳ Ɠǁ ƟƘǂǽǁǭƩǃ ǫƘƪǀ ǍǽƩǍ ƩǂƴǽǂƩə ǰǽǂ

Ɠŧ ƳƳƳ ǯƘǂǁ ƴǨƘǿƨ Ǜƶƒ Ʃǁ ǼǽƘǂǁǿ Ɠǁ pH ƩǿƿƘǭ ƟƘǂǽƘǭƩǃ ǮƳ ĕĤģ ƿ ħĥ ƳƿƴƒǀǿƩǴ Ɠǁ ƴǨƘǿƨ Ǜƶƒ ǰǽƩǬǮŧ ƿ ǰǽƩǬǂǿǁ ǻƴǿƨǂ ǻƘģnjǿƮǭ ǮƳ ǬǿƨƘǃ ƴǨƘǿƨ .ƳǁƘ ĤĤ ƿ Ħ Ƙǁ ƩǂƩǁ ǻƘģ pH ƘǽƴƘǻ ƴǨƘǿƨ ǯŇǽ ƿ ǯƫƿǮƴǿģ ƴǨƘǿƨ ǫƩə Ɠǁ ǀ ǿƩǴ Ɠǁ ǼǽƘǿǬǟ ƿ



(ĕ) ǯƫƿǮƴĠģƴĠǥǂƩř ǜ ǫǬǕǭ ƩĠƳƘǽǭ ǮƳ ƴĠǨƘĠƨ Ǜƶƒ ǯƘǭƴǴǮ :ħ ƘǕǁ

(**Fe^{2+}** = ģ/ĥĨ mM/L ¡pH =ħ ¡ĩģ**min** ǀ ǃŧǂƿ ǯƘǭƩ ¡ģ/ħ **mmol** Ƙǁ ƩǂƩǁ ƴǨƘǿƨ ƓǿƘƿǂ ƠŏǭǬǓ)



(ĕ) ǯǸǬǝ yǁĠǂƸǝ ƷƳ ǀ ǂƭǂƿ ǯǨǫƹ ǂ ƨ ƒ Ƹǀ yĠǁǨĠƨ Ǜƶƒ ǯǨǫyǁƷ :ĪǨŨǁ

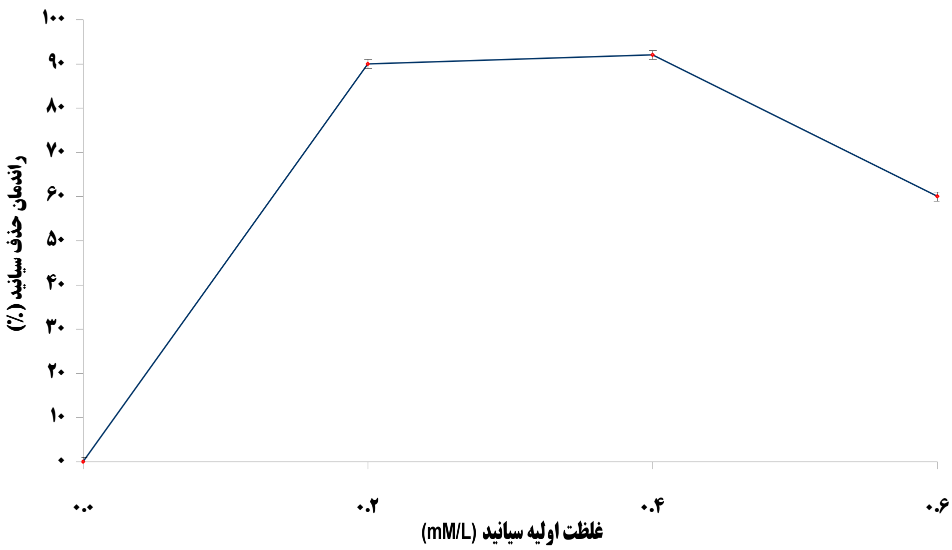
((Fe²⁺ = ǵ/ĥĪ mmol/L) Fe^{2+}/H_2O_2 = ǵ/ǵħĭŮǨǸǫ ƠǁƨǁƖ ¡pH =ħ ¡ǵ/ħ mmol ǨǺ ƸǂƸǀ yǁǨǿƨ ǴǨƿǂ ƠǒǫŬ)

ƷƳ ƟǷƨǨǉǁ Ŧǰǂƹǫ ǁǅǫ .(ĥĤƿĥǵ) yǁǸǁÆǫ ǂ ǂƭ ƭǂƽ ǂ ǴǂƸǀǸƴ ǨǺ ǂ ǂƭ ǂ (Strong Acid dissociable) ŦǿŨĀơ ǨǨǨǁ ǻǸǁ ǻǨǵyǿƨǂ ÆǁƨǸǂǫ yƒ ƷƳ ǨǄǁơ ǰǂǁǨǁ ǻǨǵ pH ƷƳ Ů(ĥĤ) YƸǿūÆǫ ƷƹǄ ǴǩǨǁǫ ǰǂƭ ƨǂǨǁǁ ǨǺ ĀǨǁǫ Ǵǂ ƠǝƸū yǵǂǸƠ ƷǂƸǄ ƸǿǨơ ƠƮơ .Ơƨǂ

¡(ĥĥ) Ơƨǂ pH ƸǿǨơ ƠƮơ ƟyǁǴǀ ǯǸǁǝ ǯǸǿƨǂyǿƨǂǂ yǁǂƸǝ yǁǨǿƨ Ǜƶƒ ǯǨǫyǁƷ Ƹǀ pH ƸǿǨơ ƟǨǂǂǨǫƸǁ Ǵǂ ǻƷǸĂ Ǵǀ ǯǨǫyǁƷ ǰǂƸǂǂ Ǵǂ YƳY ƷǨǂǁ ǴǁǨǨǁǫ ǰǂ ƷƳ ŮǯǸǁǝ yǁǂƸǝ ǆǂƨǸơ

ƷƳ ƟǿèǨǺ ǻǨǵ pH ƷƳ ƿ ěĬǵ Yƿyƒ pH =ħ ƷƳ yǿǨǿƨ Ǜƶƒ ǯǨǫyǁƷ ƸǂƸǀ ǂ ǂ ǂ ǂ ǂ ǂ

ǵƿǂ Ĥǵmin ƷƳ ǵǸǫƮǫ pH ÆǝƸĂ ƷƳ .YǸǀ ěĭǵ ƷƳ ƸǂƷǂ ǚĪ ¡(Ĥħ ƿĤĤ) (H^+ ƷǸǸǉƒ) yǿƨǂ ǨǿŨǂơ ƠǫŰ Ǵǀ ǀ ǂƭǂƿ ŮƿƸǁ ÆǿǨūǨǫ ƨǂǨǁ .(ĥ ǨŨǁ) Ơǝǂǂ ǀ ǵǨƭ Ħ Ǵǀ ħ ǨǺ ƸǂƸǀ pH ƷƳ ǴǂƸǿǁ ǻƸǂƶĞǂƷǀơ Ů(ĤĦ) yǿǨǿƨ Ǜƶƒ ǯǨǫyǁƷ Ƹǀ ǯǨǂǂƮǫ Ǵƭ ǨǺ (ĤĪ) ǂƸǂăƠ ÆǫǁǂDž ǻǨǵ ƙ Êlǂǝ ǰǿǂšǬǵ ƿ (ĤĤ) ǴǨǨƸ Ħ/Ī ǻǨǵpH ǂ ǿǂƸơ Ǵǀ ƷǿǂŮyYƳY ǫǨ ǂǂ ǯǸǁǝ ǨǫǨŰ ƷƳ ǂYǨĀǁƨǂ ƷƳ ƷƳ ǯǸǁǝ yǁǂƸǝ .yǁYǸƷǂ ƙǨǁǂ ǴǂǿǂǀpH ƷǂǸǂŰ Ǵǀ ƷƳ ħ ƿ



(mmol) yĠǁǨĠƨ ǴĠǨƿǂ ƠǒǫŬ ƷƳ ŮǨĀǫǂǫ ƸĠYǨǂǫ ƷƳ yĠǁǨĠƨ Ǜƶƒ ǯǨǫyǁƷ :ĭ ǨŨǁ

(Fe^{2+} = ǵ/ĥĪ mmol/L) Fe^{2+}/H_2O_2 = ǵ/ǵħĭŮǨǸǫ ƠǁƨǁƖ ¡ĭǵmin ǀ ǂƭǂƿ ǯǨǫƹ ¡pH =ħ ǆǂƸǁ ƷƳ)

$$Fe^{2+} + H_2O_2 \rightarrow Fe^{3+} + OH^0 + OH^- \quad (Ĥ)$$

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

$$2H_2O_2 \rightarrow 2H_2O + O_2 \quad (Ħ)$$

$$H_2O_2 + OH^0 \rightarrow H_2O + HO_2^0 \quad (ħ)$$

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

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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 Fe^{2+}/ H_2O_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 Fe^{2+}/ H_2O_2= 0.046 (Fe^{2+}=0.27 mM/L) after 6o 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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