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NaCl

min

g/L

cm

COD

[illegible]

COD ... (ACF:Active Carbon Fiber) ... Ti/TiRuO$_2$ ... Ti/Pt ... ACF ... (PbO$_2$) ... (BDD) ... Ti/Pt, Ti- Ru- Sn-SbO$_2$ ... pH ...

[illegible]

$$R + XH_2O \rightarrow ROx + 2XH^{+} + 2Xe^{-}$$

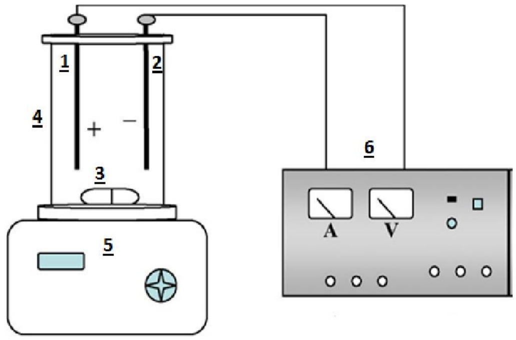
$$R + XH_2O \rightarrow ROx + 1/2CO_2 + 2XH^{+} + 2Xe^{-}$$

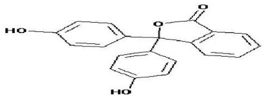
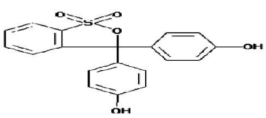
$$Co_x\,(OH^0) \rightarrow CO_x + 1/2\ O_2 + H^{+}$$

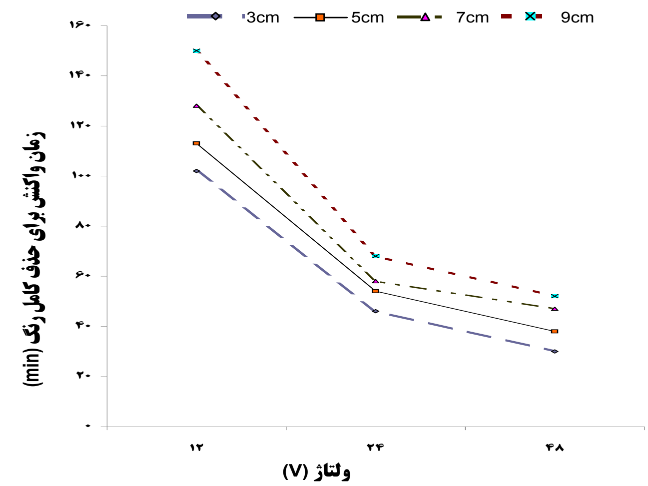
$$CO_{x+1} \rightarrow CO_x + 1/2\ O_2$$

$$2R + Co_x\,(OH^0) \rightarrow ½\ ROO + H^{+} + e^{-} + CO_x$$

$$CO_x + R \rightarrow CO_x + RO$$



وزن مولکولی (g/mol)	ماکزیمم طول موج (nm)	گروه شیمیایی	ساختمان شیمیایی	ماده رنگ‌زا
۳۱۸/۳۲	۵۵۲	هیدروکسیل تری آریل متان		فنل فتالئین
۳۵۴/۳۹	۴۳۱	تری آریل متان		فنل رد



(cm)

NaCl

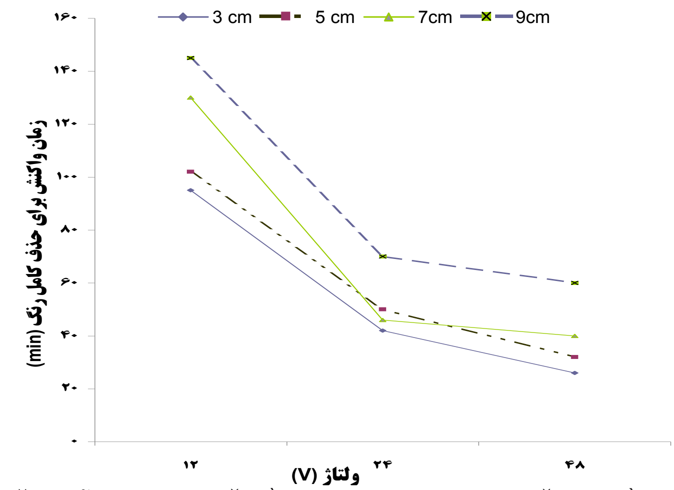
pH COD Corning 120 pH

Open Reflux-Colorimetric-5220B

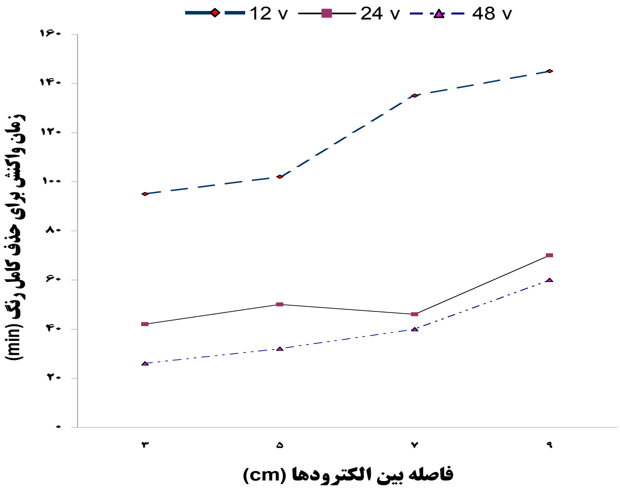
nm DR5000

SPSS (Version18)

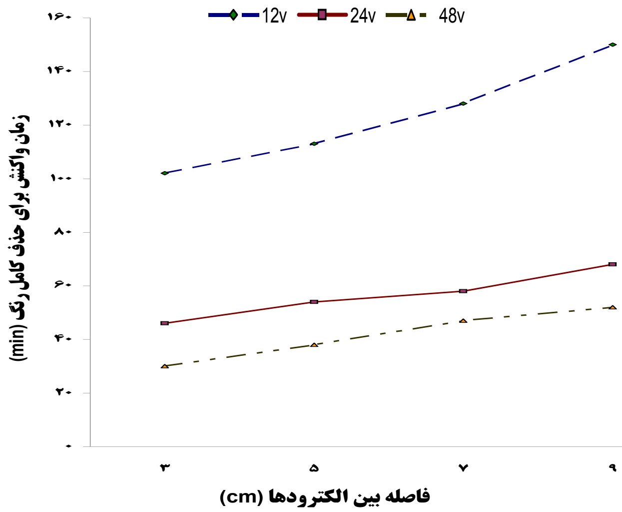
Excel



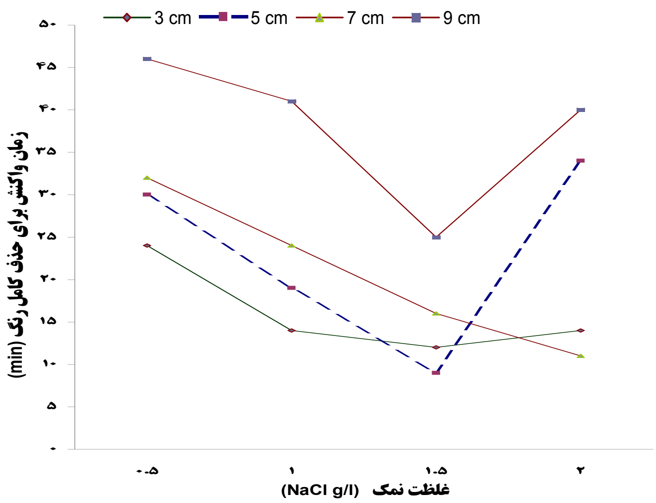
(cm)



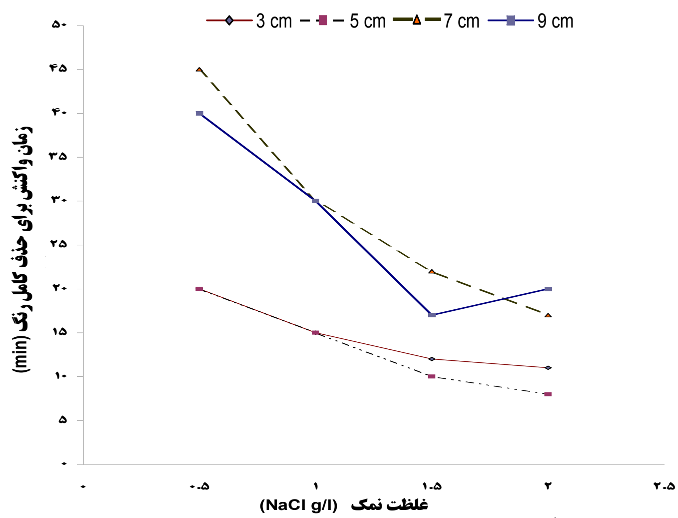
شکل ٤: تاثیر فاصله بین الکترودها بر حذف رنگ فنل فتالئین بر اساس زمان واکنش در ولتاژهای مختلف V ۱۲، ۲٤ و ٤۸



شکل ٥: تاثیر فاصله بین الکترودها بر حذف رنگ فنل رد بر اساس زمان واکنش در ولتاژهای مختلف v ۱۲، ۲٤و٤۸



شکل ٦: تاثیر غلظت نمک NaCl بر حذف رنگ فنل فتالئین بر اساس زمان واکنش در فواصل مختلف cm ۳، ۵، ۷ و ۹ با ولتاژ ثابت ۴۸ v



شکل ۷: تاثیر غلظت نمک NaCl بر حذف رنگ فنل رد بر اساس زمان واکنش در فواصل مختلف cm ۳، ۵، ۷ و ۹ با ولتاژ ثابت ۴۸ v

$$Cl^{-}+2OH^{-}\rightarrow OCl^{-}+H_2O+2e^{-}$$

$$6\ ClO^{-} + 3H_2O\rightarrow ClO_3^{-}+4Cl^{-}+ 6H + 3/2\ O_2+ 6e^{-}$$

$$4OH^{-}\rightarrow 2H_2O+O_2+4e^{-}$$

$$H_2O+2e^{-}\rightarrow H_2+2OH^{-}$$

$$R \xrightarrow{\text{active-chloro species}} O_2 + H_2O + \text{Chlorinated Final product}$$

$$Cl_2, ClO_2, O_3, OH^0, O^0, CLOH^0, H_2O_2, O_2, H_2, CO_2$$

$OH^0, O^0, CLOH^0$

$(Cl_2, ClO_2, O_3, H_2O_2, O_2, H_2)$

(Cl_2, O_2)

(ClO_2, O_3, H_2O_2)

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Investigation the Efficiency of Electrolysis Process using 3 Dimensional Graphite Electrodes for Decolonization of Phenolphthalein and Phenol red from Aqueous Environments

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ABSTRACT

Background and Objectives: The presence of chemical dyes in the water resources not only pollutes them, but also brings about death of organisms and serious indemnities to the environment through stopping oxygen production and preventing penetration of the sunlight. In this study, we investigated the efficiency of the electrolysis process for decolonization of phenolphthalein and phenol red from aqueous environment.

Materials and Methods: The experiments were conducted in an electrochemical reactor having a working volume of 1 liter equipped with 2 graphite electrodes. This study was conducted at laboratory scale. Samples were prepared by dissolving two phenol red and phenolphthalein dyes in drinking water. Then, the effect of operating parameters such as voltage, inter-electrode distance, and NaCl concentration on the complete dye removal was determined considering optimum retention time using Factorial variance analyses and the graphs were plotted using MS Excel software.

Results: the results showed that the optimum conditions for completely removal of phenolphthalein was achieved applying a voltage of 48 V, the retention time of 9 minutes, 5 cm inter-electrode distance, and the salt concentration of 1.5 g/l, whereas, complete removal of phenol red was achieved applying a voltage of 48 V, the retention time of 8 minutes, 5 cm inter-electrode distance, and the salt concentration of 2 g/l. Under these conditions, COD removal efficiency for phenol red and phenolphthalein was 85 and 80 percent respectively.

Conclusion: This study revealed that electrolysis process is an effective method to remove both phenolphthalein and phenol red dyes from effluent, because it can completely remove the dyes in a short time.

Keywords: Electrolysis, Decolonization, Phenolphthalein, Phenol red

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