

massoudi@sbmu.ac.ir

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" : *L* :

" : *NaCl* :

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..... : *min* : *V* :

..... : *g/L* : *cm* : : *min* : *V* : / *g/L* : *cm*

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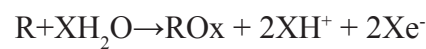
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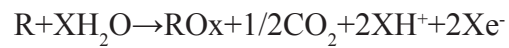
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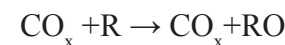
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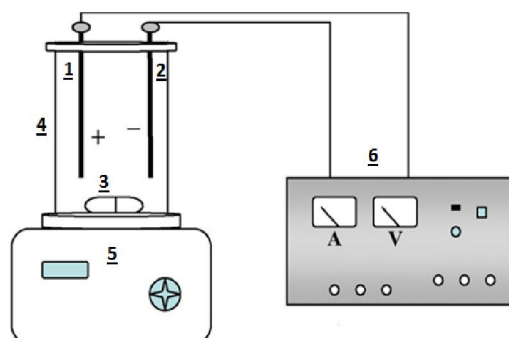
(. y) (MO_{x+1}

(OH⁰)

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در این آزمایش، از یک سلول الکتروشیمیایی برای بررسی کارایی فرایند الکترولیز استفاده می‌شود. این سلول شامل دو الکترود (1 و 2) در یک محلول الکترولیت (3) قرار دارد. الکترود 1 دارای قطب مثبت (+) و الکترود 2 دارای قطب منفی (-) است. یک منبع تغذیه (5) به الکترودها متصل است. یک آمپرمتر (A) و ولتمتر (V) (6) نیز به مدار متصل شده‌اند تا جریان و پتانسیل را اندازه‌گیری کنند.

ماده رنگ‌زا: فنل فتالین (Phenolphthalein) $C_{20}H_{14}O_4$ و فنل رد (Phenol red) $C_{19}H_{14}O_5S$.

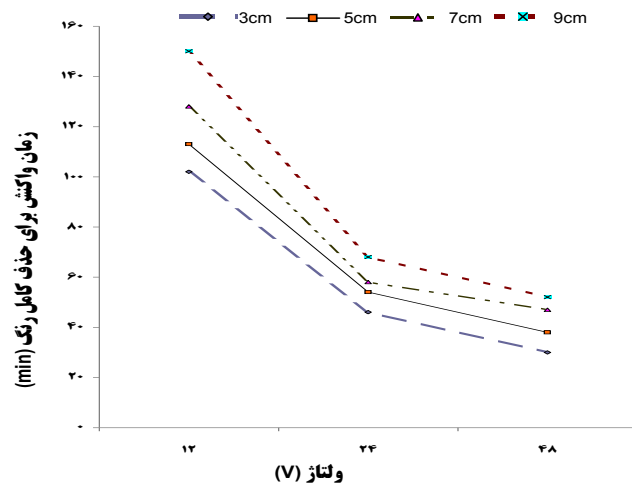
محلول‌ها: محلول $NaOH$ و محلول $NaCl$ (غلظت g/L).

پH محلول: pH .

غلظت محلول: g/mL .

حجم محلول: mL .

ماده رنگ‌زا	ساختار شیمیایی	گروه شیمیایی	ماکزیمم طول موج (nm)	وزن مولکولی (g/mol)
فنل فتالین		هیدروکسیل تری آریل متان	552	318/32
فنل رد		تری آریل متان	431	354/39



شکل ۱: زمان واکنش برای حذف کامل رنگ (min) در مقابل ولتاژ (V) برای فواصل الکترود ۳، ۵، ۷ و ۹ سانتی‌متر.

NaCl

pH

COD ; Corning 120

pH

Open Reflux-Colorimetric-5220B

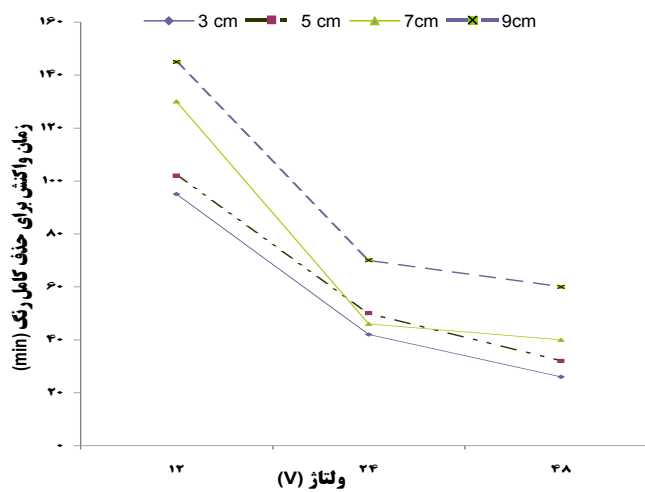
nm

DR5000

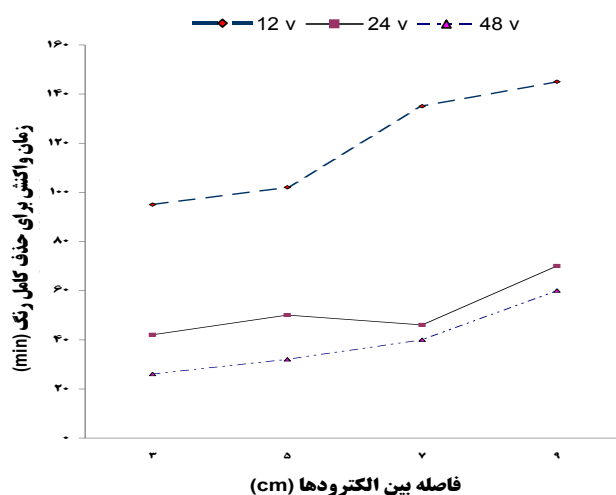
cm

SPSS (Version18)

Excel



شکل ۲: زمان واکنش برای حذف کامل رنگ (min) در مقابل ولتاژ (V) برای فواصل الکترود ۳، ۵، ۷ و ۹ سانتی‌متر.



شکل ۴: تاثیر فاصله بین الکترودها بر حذف رنگ فنل فتالین بر اساس زمان واکنش در ولتاژهای مختلف ۱۲، ۲۴ و ۴۸ V

.....

..... min : v cm

..... min : V

cm cm

..... min : V

..... min : V

V cm cm V

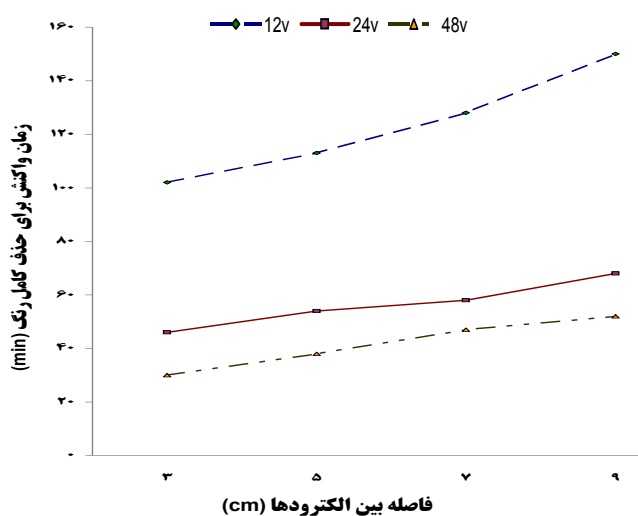
min " min V

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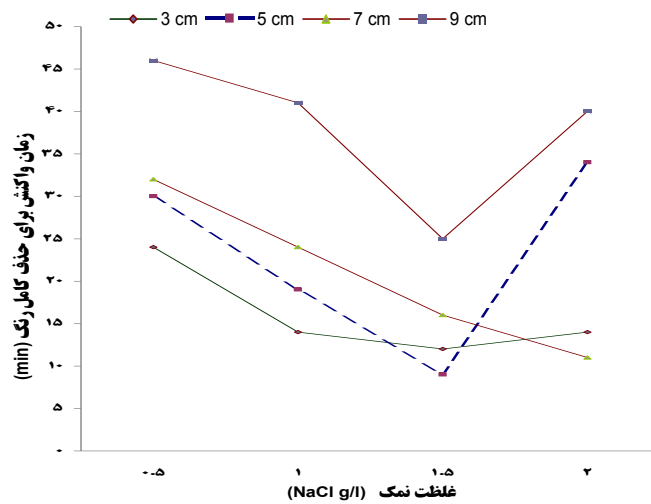
NaCl

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- cm " V "



شکل ۵: تاثیر فاصله بین الکترودها بر حذف رنگ فنل رد بر اساس زمان واکنش در ولتاژهای مختلف ۱۲، ۲۴ و ۴۸ V



شکل ۶: تاثیر غلظت نمک NaCl بر حذف رنگ فنل فتالین بر اساس زمان واکنش در فواصل مختلف ۳، ۵، ۷ و ۹ با ولتاژ ثابت ۷ ۴۸

g/L NaCl

cm

cm / g/L

cm g/L

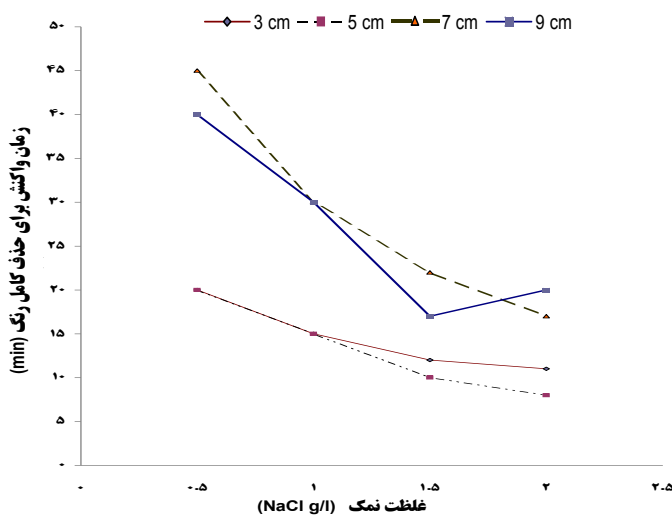
g/L

cm g/L cm

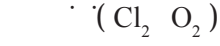
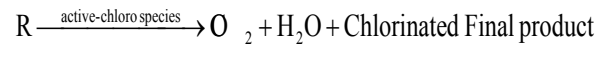
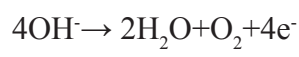
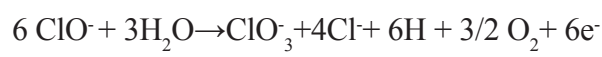
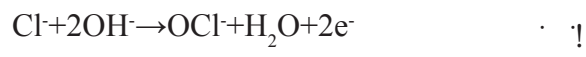
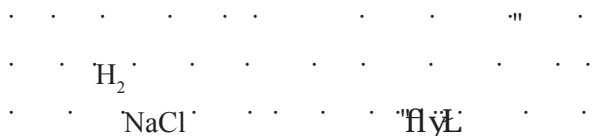
g/L min

cm

g/L



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



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Daneshvar

Dalvand

min V

cm

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()

()

()

Dalvand ()

cm

min

()

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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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