



## Evaluation of Fenton and photo-Fenton processes for the removal of *p*-chloronitrobenzene in aqueous environment using Box–Behnken design method

Majid Mohadesi<sup>a</sup>, Aref Shokri<sup>b,\*</sup>

<sup>a</sup>Department of Chemical Engineering, Faculty of Energy, Kermanshah University of Technology, Kermanshah, Iran, email: m.mohadesi@kut.ac.ir

<sup>b</sup>Young Researchers and Elite Club, Arak Branch, Islamic Azad University, Arak, Iran, email: aref.shokri3@gmail.com

Received 17 February 2017; Accepted 6 July 2017

---

### ABSTRACT

In this study, the degradation and mineralization of aqueous solution containing a main carcinogenic pollutant, *p*-chloronitrobenzene (pCNB), were investigated by Fenton and photo-Fenton processes. Also the influence of operational parameters such as initial concentrations of H<sub>2</sub>O<sub>2</sub>, ferrous ion and pCNB has been studied on the removal of pCNB and chemical oxygen demand (COD). The pH was fixed at 3.00 in all experiments. The Box–Behnken design (BBD) of experiments and the response surface methodology were used to explore the influences of three independent variables on the response functions to get the optimal conditions. The analysis of variance tests were performed to determine the significance of the effects of independent variables on the response function. Different amounts of variables were optimized for the removal of pCNB and COD in both Fenton and photo-Fenton processes. At optimum conditions and after 20 min of reaction, the removal efficiency for pCNB was 98.5% and 100.0% in Fenton and photo-Fenton processes, respectively. The removal of COD in photo-Fenton process was more effective (91.4%) than Fenton process (58.5%) after 30 min of treatment. The Fenton process was powerful in the removal of pCNB, but it can remove the COD to some extent.

*Keywords:* Fenton and photo-Fenton processes; *p*-Chloronitrobenzene; Box–Behnken design; Chemical oxygen demand; Wastewater treatment

---

\* Corresponding author.

The manuscript was written through contribution from all authors. All authors have given approval to the final version of the manuscript.

1944-3994/1944-3986 © 2017 Desalination Publications. All rights reserved.