

Investigating the effectiveness of the 3D electrofenton process with SS316/ β -PbO₂ anode and PAC-TiO₂ nanocatalyst particle electrodes in the degradation of bisphenol A from wastewater

Abstract

Introduction: Phenol is one of the organic pollutants found in industrial effluents and is highly toxic to humans and the environment, so it must be purified before discharging it into the environment. The purpose of this study is to investigate the efficiency of 3D electrofenton process with SS316/ β -PbO₂ anode and PAC-TiO₂ nanocatalyst particle electrodes in the degradation of bisphenol A from wastewater.

Materials and methods: The present experimental study was conducted on a laboratory scale and intermittently. By measuring the concentration of bisphenol A in the samples before and after the process, the efficiency of the electrochemical process in the decomposition of bisphenol A was determined. The effect of effective parameters such as current density, reaction time, pH and initial concentration of bisphenol A on the efficiency of bisphenol A decomposition process was investigated. Optimization of experiments and data analysis in the removal process to remove Bisphenol A was done using Central Composite Design (CCD).

Results: The results obtained from the experiments showed that the efficiency of the electrochemical process increases with increasing reaction time and current intensity, and decreases with increasing pH and initial dye concentration. Based on the analysis of variance of the results of the experiments among different models, the quadratic model was chosen to estimate the decomposition of phenolic compounds by two-dimensional and three-dimensional electrochemical process with G/ β -PbO₂ electrode. The linear regression coefficient (R^2) between the tests and different response values in the model was between 0.97-0.99.

Conclusion: The obtained results showed that the three-dimensional electrochemical process with SS316/ β -PbO₂ coated electrode is able to remove bisphenol A with relatively high efficiency. Also, this method can be used to treat wastewaters of oil and petrochemical industries containing phenolic compounds.

Keywords: three-dimensional electrofenton process, bisphenol A, SS316/ β -PbO₂ electrode, aqueous solutions, central composite statistical scheme.