

عنوان مقاله:

Innovative method for the fast removal of Escherichia coli from polluted water using electro-Fenton process: Modeling and investigation of the removal mechanism

محل انتشار:

بیستمین کنگره بین المللی میکروب شناسی ایران (سال: 1398)

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خلاصه مقاله:

Introduction and Objectives: Escherichia coli (E. coli) bacteria are commonly used as indicator organisms to designate of impaired surface waters and to guide the design of management practices to prevent fecal contamination of water. Water purification from harmful bacteria using cheap and eco-friendly techniques is very important. Electrochemical advanced oxidation process (EAOPs) have attracted substantial attention owing to their environmental versatility, high efficiency, and safety. Among EAOPs, electro-Fenton (EF) process is one of the electrochemical processes that consist of producing Fenton's reagent (Fe^{2+}/H_2O_2) in acidic medium (pH 3). Therefore, the current study aimed to evaluate the efficiency of the EF process for removing E.coli from polluted water. **Materials and Methods:** The central composite design employed for efficient removal of E.coli as indicator organisms by response surface methodology using Design Expert 11®. The experiments were done under five levels of various operational parameters. The initial concentration of E.coli varied among 0.1 to 5×10^7 CFU mL⁻¹, the current density ranging from 2 to 10 mA cm⁻², H₂O₂ ranging from 100 to 1000 μ L L⁻¹, inter-electrode distance ranging from 1 to 5 cm, and reaction time ranging from 1 to 10 minute. **Results:** The maximum removal rate achieved at the initial E.coli concentration of 3.5×10^7 CFU mL⁻¹, the current density of 4.5 mA cm⁻², H₂O₂ dosage of 750 μ L L⁻¹, the inter-electrode distance of 3.5 cm, within the reaction time of 6 min. Regression analysis showed the good fit of the experimental data to the second-order polynomial model with a coefficient of determination (R²) value of 0.982, adjust correlation coefficient (Adj.R²) value of 0.9750 and predicted correlation coefficient (pred. R²) value of 0.956. **Conclusion:** Using ordinary radical scavengers demonstrated that hydroxyl radical ($\bullet OH$) was the main oxidant species contributed to the removal of E.coli under the EF process.

کلمات کلیدی:

.Removal; Escherichia coli; Electro-Fenton process; polluted water treatment

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