

Synergistic degradation of triclosan from aqueous solution by combination of sulfate radical and electrocoagulation process

Arezo Rezaie^{a,b}, Mohammad Taghi Ghaneian^{a,*}, Ali Fatehizadeh^{c,d}, Fahimeh Teimouri^a,
Mohammad Mehdi Amin^{c,d}

^aEnvironmental Science and Technology Research Center, Department of Environmental Health Engineering, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, email: mtghaneian@gmail.com (M.T. Ghaneian), arezorezaie373@gmail.com (A. Rezaie), f.teimori62@gmail.com (F. Teimouri).

^bStudent Research Committee, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

^cDepartment of Environmental Health Engineering, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran, emails: a.fatehizadeh@hlth.mui.ac.ir (A. Fatehizadeh), amin@hlth.mui.ac.ir (M.M. Amin)

^dEnvironment Research Center, Research Institute for Primordial Prevention of Non-Communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran

Received 12 September 2020; Accepted 13 January 2021

ABSTRACT

The triclosan (TC) is classified as antibacterial compound as an emerging pollutant, which is extensively used in pharmaceuticals and personal care products. The present study evaluated the degradation efficiency of TC by combination of persulfate radical and electrocoagulation (PS-EC) process from synthetic industrial wastewater. To obtain optimum condition, the effect of influencing parameter on PS-EC process including solution pH, reaction time, current density, PS dose, concentration of electrolyte, initial concentration of TC, and electrode arrangement were systematically investigated. The increase of the current densities from 0.67 to 2.71 mA/cm² resulted in an increase of TC degradation efficiency from 58.7% to 65.9% after 35 min of reaction time. Up to 99.5% of TC was degraded by PS-EC process after 35 min reaction time at optimum condition including PS dose: 250 mg/L, current density: 2.71 mA/cm², electrolyte concentration: 2.5 g/L, and solution pH: 7. The operating cost including electrode and energy was calculated as 164,782 Rial/m³. The Brunauer–Emmett–Teller analysis of produced sludge during PS-EC process indicated that the specific surface area, total pore volume, and mean pore diameter were 97.8 m²/g, 0.19 cm³/g, and 7.8 nm, respectively.

Keywords: Electrocoagulation; Sulfate radical; Persulfate anions; Triclosan

* Corresponding author.