Photocatalytic Removal of Escherichia Coli by ZnO Activated by Ultraviolet-C Light from Aqueous Solution

Noroozi R (MSC)

Invironmental Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

Mehdinezhad MH (PhD)

Invironmental Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

Zafar zadeh A(PhD)

Invironmental Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

Corresponding Author: Noroozi R

E-mail: noroozi@goums.ac.ir

Abstract:

Background and objectives: There is a great interest in photocatalytic oxidation of contaminants, using ZnO, in recent years. The main objective of this research was to study photocatalytic disinfection of E. coli bacteria as water microbial pollution index, using nanoparticles of ZnO and a UV lamp in a batch reactor.

Material and Methods: In this study, the contaminated water sample was prepared through adding 10^2 and 10^3 E. coli bacteria per ml of raw water. The contaminated water entered the photocatalytic oxidation reactor and removal efficiency of E. coli bacteria in different conditions were studied, including pH (5.5, 7, and 9), time (10, 20, 30, 40, 50 and 60 mins), dose of nano particles ZnO (0.2,0.4,0.8 and 1 gr/l), number of bacterium (10^2 and 10^3 per milliliter) and voltage of UV-C lamp, 27 volts. Characterizations of ZnO nano particles were determined using scanning electron microscope equipped with Energy Dispersive X-ray Analysis (EDX) system and X-ray diffraction (XRD) method.

Results: Photocatalytic process efficiency is enhanced by increasing reaction time and dose of nano particles ZnO in the presence of UV lamp irradiation. The results show that the best conditions for removal of 10^2 and 10^3 bacteria per milliliter are obtained from condition including pH of 7, reaction time of 30 mins, 0.8 gr/l doses of nano particles ZnO and 27-volt-UV lamp.

Conclusion: The results indicate that the increase of reaction time and dose of nano particles ZnO, in the presence of radiation UV lamp, have the most significant effect on photocatalytic efficiency. Based on the results, photocatalytic can be promising method for removal of E. coli bacterium from drinking water.

Keywords: Photocatalytic, E. coli, irradiation UV, ZnO nanoparticles, Aqueous Solution