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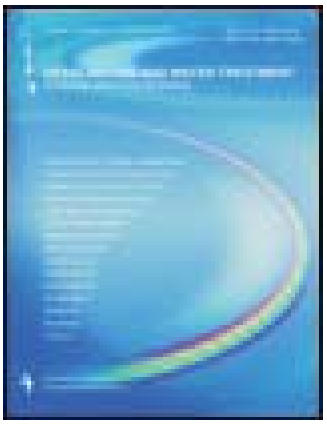

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Water disinfection by zinc oxide nanoparticle prepared with solution combustion method

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ABSTRACT

The removal of bacteria from water is a highly important process for drinking water and sanitation systems especially on growing outbreaks of water borne diseases. The aim of this study was to evaluate the water disinfection efficiency of ZnO nanoparticle synthesized by solution combustion method (SCM). The ZnO nanoparticle, as a disinfectant, was prepared by the SCM. The prepared disinfectant was characterized by scanning electron microscopy, X-ray diffraction, and Brunauer–Emmett–Teller. The disinfection efficiency of the synthesized ZnO nanoparticle was evaluated using *Escherichia coli* as an indicator organism by disk diffusion, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) tests. The results show that the synthesized ZnO nanoparticle showed an average size of 15 nm. The MIC and MBC of ZnO nanoparticle were 8 and 16 μg mL^{-1}, respectively. These results suggest that ZnO nanoparticle prepared by SCM could be used as an effective disinfectant, making this approach applicable to water-control systems.

Keywords: ZnO; Nanoparticle; Disinfection; *E. coli*; Solution combustion method

1. Introduction

Water-borne diseases remain as the leading cause of death in many developing countries. According to the WHO report, at least one-sixth of the world's population (1.1 billion people) lack access to safe water. Diarrhea is the main disease associated with unsafe water and sanitation, and is responsible for the deaths of 1.8 million people every year, mostly children under the age of five [1,2]. Generally, the water disinfection methods consist of chemical processes [3]. Chemical disinfectants such as chlorine, chloramines, and ozone, can react with various components in natural water to form harmful disinfection byproducts [4]. Furthermore, the resistance of some pathogens, such as *Cryptosporidium* and *Giardia,* to conventional chemical disinfectants requires extremely high disinfectant dosages, leading to the formation of more byproducts [5]. Therefore, there is an urgent need to reevaluate conventional disinfection methods and to consider innovative approaches that enhance the reliability of disinfection while avoiding the formation

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