Photocatalytic removal of two antibiotic compounds from aqueous solutions using ZnO nanoparticles

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\begin{abstract}
Zinc oxide (ZnO) nanoparticles were synthesized, characterized, and used for photocatalytic removal of amoxicillin and sulfamethoxazole from contaminated water. Microwave-assisted gel combustion synthesis method was optimized for type and amount of complexing agent and calcination temperature, in order to obtain the best photocatalytic activity. Characterization of ZnO nanoparticles according to their scanning electron microscopy and transmission electron microscopy images and X-ray diffraction pattern showed homogenous spherical nanoparticles with an average crystalline size of 25.82 nm. Effects of several operational factors such as pH of antibiotic solution, initial concentration of antibiotic, ZnO nanoparticles loading amount, and presence of NaCl salt or buffered solution were investigated. Results showed complete removal of antibiotic compounds in six hours using ZnO nanoparticles/UV-C irradiation. Mineralization of organic content were 62.8 and 20.8% for amoxicillin and sulfamethoxazole, respectively. Photocatalytic removal of both antibiotics followed the Langmuir–Hinshelwood model in the range of concentration of 5–20 mg L\textsuperscript{-1}. ZnO nanoparticles were used for three subsequent runs without significant decrease in their photocatalytic activity.

\textit{Keywords:} Amoxicillin; Photocatalytic degradation; Sulfamethoxazole; Contaminated water; Zinc oxide
\end{abstract}

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