Kinetics of photocatalytic mineralization of oxytetracycline and ampicillin using activated carbon supported ZnO/ZnWO₄ nanocomposite in simulated wastewater

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ABSTRACT

In this work, activated carbon supported ZnO/ZnWO₄ nanocomposite (ZnO/ZnWO₄/AC) was synthesized successfully using modified hydrothermal method. ZnO/ZnWO₄/AC composite was characterized using energy-dispersive X-ray (EDX), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-ray diffraction (XRD), and UV-visible(UV-vis) spectral analysis and transmission electron microscopy (TEM). The SEM studies clearly revealed the stacking of ZnO/ZnWO₄ over activated carbon. ZnO/ZnWO₄/AC had rod like arrangement with variable length from 45 nm to 147 nm and diameter between 26 nm to 36 nm. The photocatalytic efficacy of ZnO/ZnWO₄/AC was tested for the synergistic degradation of oxytetracycline (OTC) and ampicillin (AMP) from aqueous phase under solar light. The oxidative antibiotics degradation occurred through hydroxyl radicals. Both antibiotics were completely mineralized under solar light. The power law model was used to understand the kinetics of mineralization process. ZnO/ZnWO₄/AC exhibited significant recycle ability due to easier separation and stability in reaction solution.

Keywords: Supported ZnO/ZnWO₄; Enhanced-photocatalysis; Antibiotic removal; Power law model; Kinetics

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