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Sonocatalytic degradation of norfloxacin in aqueous solution caused by a novel Z-scheme sonocatalyst, mMBIP-MWCNT-In₂O₃ composite

Siyi Li ^a, Guowei Wang ^a, Jing Qiao ^a, Ying Zhou ^a, Xue Ma ^b, Hongbo Zhang ^a, Guanshu Li ^b,
Jun Wang ^{a,*}, Youtao Song ^{b,*}

^a College of Chemistry, Liaoning University, Shenyang 110036, P. R. China

^b College of Environment, Liaoning University, Shenyang 110036, P. R. China

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ABSTRACT

In this study, a novel Z-scheme composite sonocatalyst, mMBIP-MWCNT-In₂O₃, is successfully fabricated by using hydrothermal and calcination methods. And then, the prepared sonocatalyst is characterized by X-ray diffractometer (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), UV-vis diffuse reflectance spectra (DRS), fourier transform infrared spectra (FT-IR) and X-ray photoelectron spectroscopy (XPS). The sonocatalytic activity of mMBIP-MWCNT-In₂O₃ composite is evaluated through the degradation of norfloxacin in aqueous solution under ultrasonic irradiation. Meanwhile, the impacts of ultrasonic irradiation time, used times and scavengers on the sonocatalytic degradation efficiency are researched by using UV-vis spectroscopy. The results indicate that the addition of MWCNT accelerates the electron (e⁻) transfer and restrains the recombination of electrons (e⁻) and holes (h⁺) in Z-scheme mMBIP-MWCNT-In₂O₃ sonocatalyst. In comparison, the formation of Z-scheme sonocatalytic system and the presence of and MWCNT make the mMBIP-In₂O₃ display much higher activity in the degradation of norfloxacin. The relatively high sonocatalytic degradation ratio of norfloxacin can be got when the 10.00 mg/L norfloxacin, 1.0 g/L mMBIP-MWCNT-In₂O₃, 150 min ultrasonic irradiation (40 kHz frequency and 300 W output power), 100 mL total volume and 25-28 °C temperature are used. Subsequently, several scavengers are used to confirm the formation of the hydroxyl radical

* Corresponding author. Tel.: +86 024 62207861; Fax: +86 024 62202053.

E-mail addresses: wangjun888tg@126.com (J. Wang); wangjun891@sina.com (J. Wang); ysong_tg@126.com (Y. Song)

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