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Enhanced photoactivity of cerium tungstate-modified graphitic carbon nitride heterojunction photocatalyst for the photodegradation of moxifloxacin(Article)

Prabavathi, S.L., Saravanakumar, K., Nkambule, T.T.I., Muthuraj, V., Mamba, G.

[a]Department of Chemistry, V. H. N. Senthikumara Nadar College (Autonomous), Virudhunagar, Tamil Nadu 626 001, India
[b]Nanotechnology and Water Sustainability Research Unit, College of Science, Engineering and Technology, University of South Africa, Florida, Johannesburg, 1709, South Africa

Abstract

Design and optimization of visible-light-driven photocatalysts for degradation of organic pollutants is an important step towards environmental decontamination. In this study, wolframite cerium tungstate ($Ce_2(WO_4)_3$, (CW)) hybridized with g-C_3N_4 (CN) nanosheets was synthesized via a simple hydrothermal route followed by an ultrasound-assisted synthesis method. The prepared $Ce_2(WO_4)_3$@ g-C_3N_4 (CW@CN) heterojunction was investigated for photocatalytic degradation of the antibiotic moxifloxacin (MXF) under visible light irradiation. Structural, morphological, and optical properties as well as chemical composition of the as-synthesized heterojunction were investigated by transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), UV–Vis diffuse reflectance spectroscopy (UV–Vis DRS) and photoluminescence (PL). MXF photocatalytic degradation by the binary nanostructure ($Ce_2(WO_4)_3$@ g-C_3N_4) (94.1%) was the highest compared to g-C_3N_4 (53.6%) and $Ce_2(WO_4)_3$ (46.4%). Such enhanced activity could be ascribed to efficient suppression of the charge carriers' recombination, leading to adequate formation of the reactive species responsible for MXF degradation. Furthermore, the $Ce_2(WO_4)_3$@ g-C_3N_4 heterojunction showed remarkable stability over five consecutive cycles, with only 11.5% reduction after the 5th cycle. This work established the potential applicability of $Ce_2(WO_4)_3$@ g-C_3N_4 nanostructures towards photocatalytic removal of MXF. © 2020, Springer Science+Business Media, LLC, part of Springer Nature.

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Muthuraj, V.; Department of Chemistry, V. H. N. Senthikumara Nadar College (Autonomous), Virudhunagar, Tamil Nadu, India;