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Journal of Industrial and Engineering Chemistry

Volume 80, 25 December 2019, Pages 558-567

Construction of heterostructure $CoWO_4/g\text{-}C_3N_4$ nanocomposite as an efficient visible-light photocatalyst for norfloxacin degradation(Article)

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Abstract

The $CoWO_4$ nanoparticles assembled with $g\text{-}C_3N_4$ nanosheets were successfully fabricated by means of a simple hydrothermal method, followed by ultrasonication. The surface topography, crystalline structure, chemical status, and optical properties of as-prepared materials are well characterized herein. These studies unveil the formation of $CoWO_4$ nanoparticles assembled on the surface of $g\text{-}C_3N_4$ nanosheets with good crystallinity. EDX and XPS studies substantiated that there were no impurities in the synthesized photocatalyst materials. Furthermore, surface topographical (TEM) analysis affirms that $CoWO_4$ nanoparticles were successfully anchored to $g\text{-}C_3N_4$ nanosheet. This worthy interfacial contact between $CoWO_4$ and $g\text{-}C_3N_4$ leads the transfer and separation of photo-induced charge carriers. The effect of catalyst loading and initial substrate concentrations on photocatalytic degradation of norfloxacin by as-prepared samples were examined under visible light. We found that the rate of $CoWO_4$ and $g\text{-}C_3N_4$ photocatalytic degradation of norfloxacin was 3.18 times and 2.69 times higher than that of pure $g\text{-}C_3N_4$ and $CoWO_4$, respectively. Enhanced photocatalytic activity was because the synergism between $CoWO_4$ nanoparticles and $g\text{-}C_3N_4$ nanosheets inhibit the fast recombination of photogenerated e^-–h^+ pairs. In addition, the radical scavenger study substantiates that $^{[rad]}OH$ plays dominate role for norfloxacin degradation rather than $O_2^{[rad]-}$. A possible mechanism responsible for photodegradation of the Z-scheme was ultimately proposed. This work can be useful in the rational design and delivery of new types of Z-scheme photocatalysts.

Author keywords

$CoWO_4/g\text{-}C_3N_4$ Kinetics Norfloxacin Synergistic effect Visible light

Indexed keywords

Engineering controlled terms: Carrier mobility Crystallinity Enzyme kinetics Impurities Light Nanocrystalline materials Nanoparticles Nanosheets Optical properties Topography

Engineering uncontrolled terms: CoWO4/g-C3N4 Effect of catalyst loadings Norfloxacin Photo catalytic degradation Substrate concentrations Synergistic effect Visible light Visible-light photocatalysts

Engineering main heading: Photocatalytic activity

Funding details

Funding sponsor	Funding number	Acronym
Ministry of Oceans and Fisheries		MOF

Funding text

This research was a part of the project titled 'Development of a water treatment system to remove harmful substances of ecological disturbances emitted from quarantine stations screening up imported fishery products', funded by the Ministry of Oceans and Fisheries , Korea.

ISSN: 1226086X
DOI: 10.1016/j.jiec.2019.08.035
Source Type: Journal
Document Type: Article
Original language: English
Publisher: Korean Society of Industrial Engineering Chemistry

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