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Enhanced photocatalytic conversion of organic dyes using CeFeO_3/MoS_2 heterojunction as a highly effective visiblelight-driven photocatalyst

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The CeFeO_3/MoS_2heterojunction was successfully prepared through the hydrothermal method. The synthesized heterojunction structure was characterized by various techniques and applied to the conversion of methylene blue (MB) under irradiation of visible light. To characterize the new heterojunction structure, Fourier transformed infrared (FT-IR), field emission scanning electron microscope (FE-SEM), energy-dispersive X-ray spectroscopy (EDXS), Xray diffraction (XRD), photoluminescence spectroscopy (PL), differential reflectance spectroscopy (DRS), and transmission electron microscopy (TEM) analyses were used. The FE-SEM images illustrated the successful deposition of MoS_2 flower-like on the surface of CeFeO_3 perovskite with 46 nm as an average size. The influence of the amount of catalyst, temperature, pH, and electron acceptor were investigated. By CeFeO_3/MoS_2heterostructures photocatalyst, the conversion rate of MB reached 98% within 20 min, whereas by CeFeO_3 perovskite no significant conversion was observed in MB. The higher photocatalytic performance of CeFeO_3/MoS_2heterostructures is assigned to their lower charge recombination compared to CeFeO_3 perovskite. Moreover, the photocatalytic mechanism and recycling experiments of CeFeO_3/MoS_2heterostructures are discussed in detail. The CeFeO_3/MoS_2heterostructures are thus promising photocatalysts for the cleanup of polluted water.

Keywords: conversion of dyes, heterojunction, perovskite, photocatalyst

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