3D Flower-Like Gadolinium Molybdate Catalyst for Efficient Detection and Degradation of Organophosphate Pesticide (Fenitrothion)

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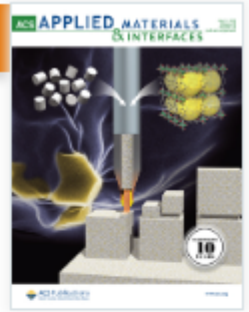

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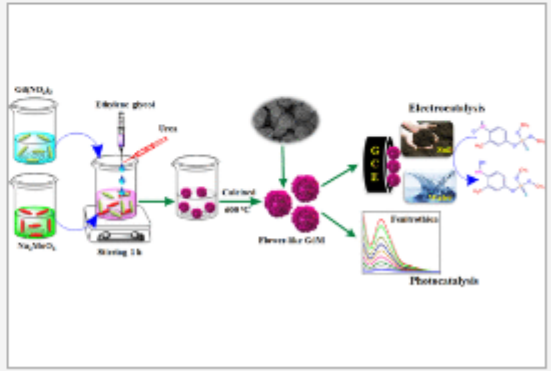
SUBJECTS: Catalysts, Degradation, Electrodes, Photodegradation, Redox reactions

Abstract

Three-dimensional (3D) nanostructured materials have received enormous attention in energy and environment remediation applications. Herein, we developed a novel 3D flower-like gadolinium molybdate (Gd_2MoO_6; GdM) and used as a bifunctional catalyst for the electrochemical detection and photocatalytic degradation of organophosphate pesticide fenitrothion (FNT). The flower-like GdM catalyst was prepared via a simple sol–gel technique with the assistance of urea and ethylene glycol. The properties of GdM were confirmed by various spectroscopic and analytical techniques. The GdM catalyst played a significant role in electrochemical reduction of FNT and results in a very low detection limit (5 nM), wide linear ranges (0.02–123; 173–1823 μM), and good sensitivity (1.36 μA μM^{-1} cm^{-2}). Interestingly, the GdM electrocatalyst had good recoveries to FNT in soil and water sample analysis. In addition to trace level detection, the flower-like GdM was used as the photocatalyst which portrayed an excellent photocatalytic degradation behavior to eliminate the FNT in the aqueous system. The GdM photocatalyst could degrade above 99% of FNT under UV light irradiation with good stability even after five cycles.



KEYWORDS: catalyst, pollutant, pesticides, fenitrothion, Gd_2MoO_6, electrocatalyst, photocatalyst