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Environmental remediation of aqueous methyl orange dye solution via photocatalytic oxidation using Ag-GdFeO₃ nanoparticles

By: Baeissa, ES (Baeissa, E. S.)^[1][View ResearcherID and ORCID](#)

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Abstract

Gadolinium orthoferrite nanoparticles were prepared using a hydrothermal method, and silver metal was deposited onto the via a photoassisted deposition method. Gadolinium orthoferrite and silver deposited gadolinium orthoferrite nanoparticles were characterized by different techniques, including XPS, XRD, UV-Vis, PL, TEM and BET surface area methods. The photocatalytic performances of gadolinium orthoferrite and silver deposited gadolinium orthoferrite nanoparticles were studied in the context of methyl orange dye degradation using visible light irradiation. The results suggest that silver was deposited onto the gadolinium orthoferrite nanoparticle surfaces as metallic silver, and the silver band gap and dispersion were controlled by the deposited silver weight percentage. In addition, the silver deposited gadolinium orthoferrite nanoparticle band gap is smaller than the gadolinium orthoferrite nanoparticle band gap. The 0.6 wt% silver deposited gadolinium orthoferrite nanoparticle exhibited the lowest band gap and highest photocatalytic activity. The structure of the 0.6 wt% silver deposited gadolinium orthoferrite nanoparticle remained stable after being reused for five methyl orange dye degradation experiments. (C) 2016 Elsevier B.V. All rights reserved.

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Author Information

Reprint Address: Baeissa, ES (reprint author)

King Abdulaziz Univ, Fac Sci, Dept Chem, POB 80203, Jeddah 21589, Saudi Arabia.

Organization-Enhanced Name(s)

King Abdulaziz University

Addresses:

[1] King Abdulaziz Univ, Fac Sci, Dept Chem, POB 80203, Jeddah 21589, Saudi Arabia

Organization-Enhanced Name(s)

King Abdulaziz University

E-mail Addresses: elhambaeissa@gmail.com

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