

Title: Ferrite-based photocatalysts: Synthesis, modifications, and key parameters in photocatalytic-related applications

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Abstract: In the recent decade, researchers have given exceptional attention to synthesizing and characterizing ferrite ceramics and their substituted products due to their considerable applications in several industrial and technological fields. Ferrite nanomaterials show, among others, low power losses, relatively cheaper, high permeability value, semiconducting nature, and chemical stability, which qualify them for several outstanding applications. Their applications in heterogeneous systems for environmental remediation are of great concern due to their lower band-gap energies, high specific surface areas, and easy separation after use. The main emphasis of this review was to summarize the recent advancements in synthesis methods, modification, and the application of ferrites as photocatalysts. The potential effects of various modified materials, such as sulfur, nitrogen, cobalt, zinc, nickel, etc., on ferrites' structural and photocatalytic properties have been explored. The photoreactor designs (suspended and immobilized) and their critical operational parameters, such as the concentration of the catalyst, pH, temperature, concentration of the contaminants, dissolved oxygen, and light source, are discussed. This review provides a better understanding of the researchers' ability to select the right conditions to synthesize ferrites with specific morphology and photocatalytic properties. Further applications in biomedical areas, photochemical water-splitting, carbon dioxide reduction, and photocatalytic degradation of pollutants are also surveyed. Finally, as future recommendations, several viewpoints are provided to promote the efficient and environmentally friendly production and application of ferrites-based nanomaterials in water purification, even at the industrial scale.

Keywords: Ferrite ceramics, Ferrite nanomaterials, Photocatalysis, Synthesis methods, Structural modification, Environmental remediation, Photoreactor design, Band-gap energy, Surface area

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