Patent Search

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Abstract:

ABSTRACT The present invention describes a method for tuning of antimycobacterial and photocatalytic activity of ZnO nanoparticles with Cu2+ doping. In the present invention the nanoparticles of copper (Cu) doped zinc oxide (ZnO) have been synthesized using a chemical precipitation method specifically aimed at enhancing photocatalytic and antibacterial activity. The structural, morphological, phase constitutional, functional, elemental, and optical properties have been studied using transmission electron microscopy (TEM), Powder X-ray diffraction (PXRD), Fourier-transform infrared (FTIR) spectroscopy, Thermo gravimetric analysis (TGA), and Ultraviolet diffused reflectance spectroscopy (UV-DRS). Further, photo-catalytic dye degradation was studied to understand the photocatalytic behavior of synthesized nanoparticles. The d-spacing was calculated using a high-resolution transmission electron microscope (HR-TEM). The adsorption study has revealed that optimum doping of Cu is mandatory to get the highest degradation of methylene blue (MB) dye. Here, we have reported that 5% Cu-doped ZnO nanoparticles have the highest photocatalytic activity. Accompanied Drawings [FIG.1-10]

Complete Specification

DESC:FIELD OF INVENTION:
This invention generally relates to the field of the antimycobacterial and photocatalytic activity of ZnO nanoparticles, and more particularly relates to a method for tuning of antimycobacterial and photocatalytic activity of ZnO nanoparticles with Cu2+ doping.
BACKGROUND OF THE INVENTION
In the last few decades, ZnO nanoparticles (NPs) because of their unique mechanical, optical, and electronic properties have triggered extensive research activities. ZnO NPs are gaining attention from researchers because of their low-temperature synthesis, variable morphologies, excellent optical properties, high crystallinity, desired electrical characteristics, and high chemical sensitivity. ZnO NPs find a wide range of applications in photocatalysis, water-splitting, biochemical sensing, gas sensing, photovoltaics, electronics, etc. ZnO is one of the most evolving semiconductor metal oxides due to its specific physiochemical behavior, high reactivity with oxygen, and high electron transfer capabilities, which are important characteristics in many applications.
Despite these unique properties, the sensing, photocatalytic and antibacterial properties of ZnO NPs were found to be inadequate. Recent studies have focused on the combination of catalytic species to overcome these issues. Doping of ZnO NPs with transition metals, like Manganese, Nickel, Cobalt, Iron, and Aluminium has been showing a significant impact on the optical, magnetic, electrical, and electronic properties. The characteristics of doped ZnO NPs strongly depend upon the kind and content of transition metal doped. Among various metallic dopants, Cu is important as it creates localized impurity levels, thereby enhancing the luminescence. It is electronically, structurally, physically, and chemically identical to Zn, and it modifies the optical properties and microstructure of ZnO compound. Because of their similar ionic radii (Cu2+: 0.73 Å and Zn2+: 0.74 Å) and similar valence state configuration, Cu atoms can replace Zn in the ZnO lattice structure. Also, because of low formation energy and large

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