JMC Publication

JOURNAL OF ADVANCED APPLIED SCIENTIFIC RESEARCH, Vol. 4, No. 3, 1-7, 2022
https://doi.org/10.46947/joaasr432022238

Green facile synthesis of Ag-doped ZnO nanoparticles from Gymnema sylvestre leaf extract and investigation of their Antibacterial activity

P. Vijaya Kumar[1], M. Karthikeyan[2]*,A. Jafar Ahamed [3],A. Ravikuma[4]B. Ragavi[2]

Abstract

The unique characteristics of the green synthesis pathway have opened the way for a new field of scientific investigation. Gymnema sylvestre (G. sylvestre) leaves extract was employed as a reducing and capping agent in the current investigation to produce pure zinc oxide (ZnO) (G1) and silver doped zinc oxide (Ag doped ZnO) (G2) nanoparticles (NPs). XRD, FESEM, EDAX, and FT-IR investigations stood used to study the structural characterization of G1 and G2 NPs. The UV–Vis and PL analyses were used to examine the optical characteristics. The results clearly reveal that the leaf extract is the best possible stabilizing agent for the manufacture of G1 and G2 NPs, and that the generated nanoparticles operate as potent microbial agents, inhibiting the growth of a variety of dangerous microbes. Due to their eco–friendly and non–toxic compatibility, the prepared G1 and G2 NPs can be employed for therapeutic and other purposes.

Keywords

Zinc Oxide, Nanoparticles, Gymnema sylvestre, characterization, antimicrobial activity.

[1] *Department of Chemistry, Jairams Arts and Science College, Affiliated to Bharathidasan University, Karur- 639 003, Tamil Nadu, India.*
[2] *Department of Chemistry, Periyar Maniammai Institute of Science and Technology, Vallam, Thanjavur- 613 403, Tamil Nadu, India.*
[3] *Post Graduate and Research Department of Chemistry, Jamal Mohamed College (Autonomous), Affiliated to Bharathidasan University, Tiruchirappalli - 620 020, Tamil Nadu, India.*
[4] *Department of Chemistry, SRM TRP Engineering College, Tiruchirappalli, Tamil Nadu – 621 105*
***Corresponding author:** karthichemist10@gmail.com

1. Introduction

Nanotechnology is a widely used and successful technology that is employed in a different fields, like biomaterials, nanomedicines, nanoelectronics, energy processing, and consumer goods. In a variety of industries, including electrical devices and biosensors, silver (Ag) and ZnO NPs with antibacterial properties have been discovered. [1,2]. Also, hybrid nanotechnologies have recently gotten a plenty of attention since they allow for new and improved functionality by altering the surface of each particle [3].

Pure ZnO nanostructures are prone to optical and structural flaws such as point defects, oxygen vacancies, and other flaws [4]. As a result, pure ZnO nanostructures are unsuitable for industrial use. To compensate for these flaws, ZnO nanostructures must be doped with noble metals. Platinum and gold-doped ZnO NPs have been shown in numerous studies [5] to have superior catalytic activity than pure ZnO. Platinum, like gold, is a very cost-effective material for industrial use. Due to the inexpensive cost of silver when compared to other metals, silver-based products are regarded as acceptable for industrial applications [6–8]. Consequently, in the modern world, most researchers are focusing on adding Ag NPs to ZnO to make the composite work better [9].

Furthermore, antibacterial activities of ZnO NPs have been demonstrated against oral microorganisms that cause tooth decay. Metal oxide NPs be present originate to be effective in bacterial control, for both gram-negative (G+) and gram-positive (G-) bacteria than bigger particles [10–12]. Synergistic antibacterial activity (ZnO/Ag) have been found to have a substantial impact against G+ and G- bacteria than their constituents [13]. When ZnO-Ag NPs are combined, bacterial activity and the formation of reactive oxygen species (ROS) are expected to rise. [14–15].

In this study, G. sylvestre leaf extract is used as a capping and reducing agent to manufacture of Ag2+ doped ZnO NPs. Investigations are performed on the structural, optical, and morphological characteristics of natural leaf extract and Ag2+ doped ZnO NPs, as well as their good applications in antibacterial activities.