



National Conference on Sustainable Developments in Engineering,
Science, Humanities and Management (NCSDESHM – 2025)
28th December, 2025, Raipur, Chhattisgarh, India.

CERTIFICATE NO: NCSDESHM /2025/ C1225937

A Study of Green Synthesis and Biological Applications of Metal Oxide Nanoparticles

Bushra Fatmi

Research Scholar, Department of Chemistry, Mansarovar Global University, Sehore, M.P., India.

ABSTRACT

Green synthesis of metal oxide nanoparticles (MONPs) has emerged as a sustainable and eco-friendly approach in nanotechnology. Unlike conventional physical and chemical methods, green synthesis utilizes natural resources such as plant extracts, bacteria, fungi, and algae to produce nanoparticles, avoiding the use of toxic chemicals and reducing environmental hazards. This method not only ensures cost-effectiveness but also enhances the biocompatibility and stability of the nanoparticles. Metal oxide nanoparticles, such as zinc oxide (ZnO), titanium dioxide (TiO₂), and iron oxide (Fe₃O₄), have demonstrated remarkable biological properties, including antibacterial, antifungal, antioxidant, and anticancer activities. These properties make them highly useful in medical, pharmaceutical, and environmental applications. For example, ZnO nanoparticles synthesized through plant-mediated methods have shown significant antimicrobial activity against pathogenic bacteria, while TiO₂ nanoparticles are widely used in photocatalytic and drug delivery applications. The green synthesis process also allows control over particle size, shape, and surface properties, which are critical factors in determining biological activity.