

Green Synthesis of Zinc oxide nanoparticles and Their Applications for Environmental Remediation

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Abstract: *The present work is intended to prepare zinc oxide nanoparticles (ZnO NPs) via facile and green routes using natural extracts, and their applications in different fields. The preparation procedure was optimized, and the prepared ZnO NPs were characterized using different chemical and physical characterization techniques such as TEM, SEM, XRD, and Surface area analysis, to investigate their morphological structure. The prepared ZnO NPs were used for environmental remediation of various pollutants from aqueous solutions; lead ions; as an example of heavy metals, paracetamol; as an example of organic pollutants. The effect of different experimental conditions on the removal process was investigated in order to enhance the removal efficiency. The removal of lead ions and paracetamol by ZnO NPs was explored kinetically and thermodynamically using different kinetic models, to obtain a better understanding of the removal process. The applicability of the ZnO NPs for the removal of lead ions, and paracetamol was explored using different real environmental water samples, and the results indicated that the ZnO NPs have great potential to remove ammonium ions from aqueous solution. Also, the anti-microbial activity of the green prepared ZnO NPs was explored using different bacterial strains, and the results indicated the high efficiency of the prepared ZnO NPs as an anti-bacterial agent.*

Keywords: *Lead; Paracetamol, Bacteria, Zinc Oxide nanoparticles; Water treatment; Kinetics; Thermodynami*