



Green Synthesis and Characterization of Zinc Oxide Nanoparticles (ZnO NPs) And Copper Oxide Nanoparticles (CuO NPs) Using Punica Granatum (Pomegranate) Fruit Extract

Swapnali M. Chavan^{1*}

¹Department of Chemistry

Shriram Mahila Vidnyan Mahavidhyalaya, Paniv, Malshiras, Solapur, MS, India.

*Corresponding Author: chavanswapnali81@gmail.com

Abstract: Green synthesis has gained prominence as an environmentally friendly approach to produce nanoparticles (NPs). This research paper focuses on the green synthesis and characterization of zinc oxide nanoparticles (ZnO NPs) and copper oxide nanoparticles (CuO NPs) using Punica granatum (pomegranate) fruit extract. The study commences with an extensive literature review, elucidating the principles and significance of green synthesis in mitigating the adverse environmental impacts of conventional synthesis methods. The potential of Punica granatum fruit extract, abundant in bioactive compounds like phenolic compounds, flavonoids, and organic acids, is emphasized as an effective reducing and stabilizing agent for ZnO and CuO NP synthesis. In the materials and methods section, the experimental procedures are detailed. Punica granatum fruit extract is prepared and utilized for the green synthesis of ZnO and CuO NPs. The facile and cost-effective approach involves employing the extract as a reducing agent for nanoparticle synthesis. The characterization of the synthesized nanoparticles is accomplished using various techniques, including X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier-transform infrared spectroscopy (FTIR), and UV-Vis. spectroscopy, to assess their size, morphology, crystallinity, and optical properties. The results demonstrate successful synthesis, yielding well-defined ZnO NPs and CuO NPs with controlled size distributions.

Keywords: Punica granatum, nanotechnology, zinc oxide nanoparticles (ZnONPs), copper oxide nanoparticles (CuO NPs).

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