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Revitalizing Crustacean Waste: Novel Antibacterial Carbon Dots and Copper-Doped Zinc Oxide Composite for Effective Waste Management

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Abstract*: This research article presents a comprehensive investigation into the synthesis, characterization, and antibacterial activity of novel nanocomposite of Carbon dot with Copper doped Zinc Oxide. Fluorescent carbon dots were successfully synthesized from prawns shell waste via hydrothermal method and characterized through XRD, TEM, UV-Visible spectroscopy, and FTIR analysis, confirming their size, morphology, and functional groups. Concurrently, zinc oxide and copper-doped zinc oxide nanoparticles were synthesized and characterized, demonstrating changes in crystal size, morphology, and elemental composition upon copper doping. It was further made into nanocomposite with carbon dot.The primary focus of this study was on the antibacterial properties of these materials. A comparative analysis revealed that the carbon dot@ZnO-Cu nanocomposite exhibited significantly enhanced antibacterial activity against E. coli and S. aureus when compared to carbon dots alone and carbon dot@ZnO nanocomposite. These findings underscore the potential of this novel nanocomposite for advanced antibacterial applications.*

Keywords: Carbon dot, Nanocomposite, Crustacean waste, Antibacterial activity.

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