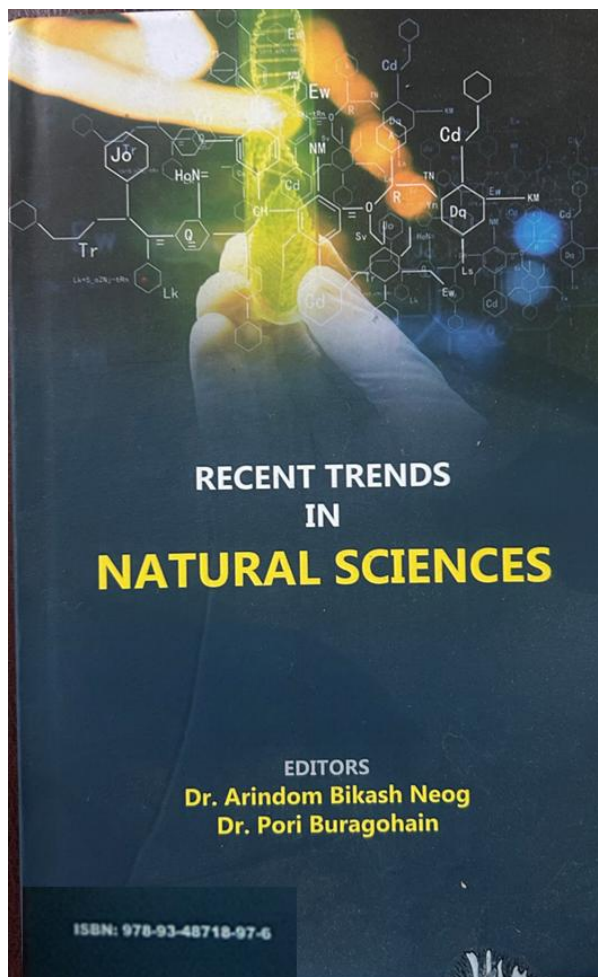


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CHAPTER-4 **Bio-Derived Materials for Wastewater Treatment: Sustainable Nanostructures and Functional Applications**

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Abstract

This chapter explores the potential of bio-derived materials in wastewater treatment, with a focus on their nanostructural features, functionalization strategies, and application in removing diverse classes of contaminants. Emphasis is placed on both the fundamental mechanisms governing pollutant capture and degradation, as well as practical considerations for scaling up these technologies. By leveraging the unique properties of natural architectures and combining them with modern nanotechnology, bio-derived materials hold the promise of delivering efficient, sustainable, and multifunctional solutions for one of the most critical challenges of our time.

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