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Comparative Study of Bioplastics and Conventional Plastics

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Abstract: Plastics have become an integral part of modern life, but their environmental impact has raised concerns globally. This study presents a comparative analysis of bioplastics and conventional plastics, evaluating their sustainability, biodegradability, and overall environmental impact. Conventional plastics, derived from petroleum-based polymers, contribute significantly to microplastic pollution and have a high carbon footprint. In contrast, bioplastics, such as polylactic acid (PLA) and polyhydroxyalkanoates (PHA), are derived from renewable resources and offer improved compostability and biodegradation properties. Through a life cycle assessment (LCA), this study examines the advantages and limitations of both materials in terms of waste management and green chemistry principles. While bioplastics present a promising eco-friendly alternative, challenges such as cost, production scalability, and disposal methods remain critical factors for widespread adoption. The findings highlight the need for innovation in biodegradable polymer technologies to achieve a balance between functionality and environmental sustainability.

Keywords: Bioplastics, Conventional Plastics, Biodegradability, Sustainability, Microplastics, Renewable Resources, Petroleum-Based Polymers, Compostability, Carbon Footprint, Life Cycle Assessment (LCA), Green Chemistry, Waste Management, Biodegradable polymers, Eco-friendly alternatives, Environmental impact, Polyhydroxyalkanoates (PHA), Polylactic acid (PLA)



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