

Advancements in Biodegradable Polymers for Sustainable Packaging

Golekar Sham Machchhindra

Associate Professor

Jamkhed Mahavidyala, Jamkhed

Abstract: *The global surge in plastic pollution has intensified the demand for sustainable packaging solutions, positioning biodegradable polymers as a critical alternative to conventional plastics. This study presents a comprehensive review of recent advancements in biodegradable polymers, focusing on their sources, classification, biodegradation mechanisms, and industrial applications in packaging. Key materials such as polylactic acid (PLA), polyhydroxyalkanoates (PHAs), starch-based polymers, and cellulose derivatives are examined for their improved mechanical and environmental performance. Despite significant progress, challenges including high production costs, variable degradation rates, and limited waste management infrastructure remain obstacles to widespread adoption. The study highlights the role of regulatory frameworks and consumer awareness in promoting biodegradable packaging and outlines future research directions to enhance material properties and sustainability. Overall, biodegradable polymers offer promising pathways toward reducing plastic waste and advancing a circular economy in packaging industries.*

Keywords: Biodegradable Polymers, Sustainable Packaging, Polylactic Acid (PLA), Polyhydroxyalkanoates (PHAs), Biodegradation Mechanisms, Compostable Packaging, Plastic Pollution