

Review Paper: Chitin and Chitosan: Versatile Polymers for Sustainable Applications

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This review delves into the extensive potential of chitin and its derivative, chitosan, as sustainable materials with diverse applications across industries. Chitin, the second most abundant biodegradable polymer in nature, boasts exceptional chemical and biological properties that have garnered attention for industrial and biomedical use. The review underscores the sustainability of chitin extraction, particularly from discarded marine food production waste like crustacean shells, presenting a green and eco-friendly alternative. Enzymatic extraction methods emerge as environmentally conscious approaches for chitin recovery. These sustainable materials find applications in various sectors, ranging from food, agriculture, and biomedicine to cosmetics and environmental solutions. Biotechnological production methods, including enzymatic and fermentation processes, further contribute to greener alternatives and innovative applications. Chitosan, derived from chitin through deacetylation, possesses distinct properties that make it a valuable commodity across industries. Chemical and enzymatic deacetylation methods provide tailored chitosan products for specific applications, enhancing their versatility. The biological properties of chitin and chitosan encompass a wide spectrum, from anti-cancer and antimicrobial effects to wound healing, drug delivery, and environmental solutions. Their renewable nature positions them as eco-friendly solutions for various industries. The review also highlights the antioxidant potential of chitosan, particularly its role in combating oxidative stress-related diseases. Factors influencing its antioxidant capacity, such as degree of deacetylation and molecular weight, are explored alongside mechanisms for enhancement. In conclusion, the remarkable properties and versatile applications of chitin and chitosan hold immense promise for sustainability across diverse industries. The use of these biodegradable materials not only addresses environmental concerns but also offers innovative solutions for numerous challenges faced by modern society.

Keywords: Chitin, Chitosan, Sustainable materials, Biomedical applications, Enzymatic extraction, Antioxidant potential

Acknowledgement: We extend our sincere gratitude to the University of Peradeniya for generously providing funding support through the University Research Grant.