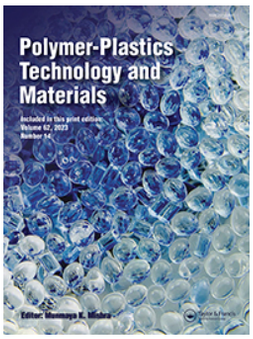

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Chemically modified water-soluble chitosan derivatives: Modification strategies, biological activities, and applications

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ABSTRACT

Chitosan, a biocompatible and nontoxic heteropolymer derived from chitin, offers various applications. However, its limited solubility above pH 6.5 hinders its broader applications. Chemical, physical, and enzymatic modifications have greatly improved chitosan properties, producing water-soluble chitosan (WSC) and derivatives. WSC and its derivatives possess unique structures, properties, and water solubility, meeting the demands of functional materials. This review highlights native chitosan characteristics, modification strategies for WSC and emphasizes its applications in food production, wastewater treatment, biomedical, and agriculture. Future perspectives for WSC and its derivatives are also discussed at the end of this paper.

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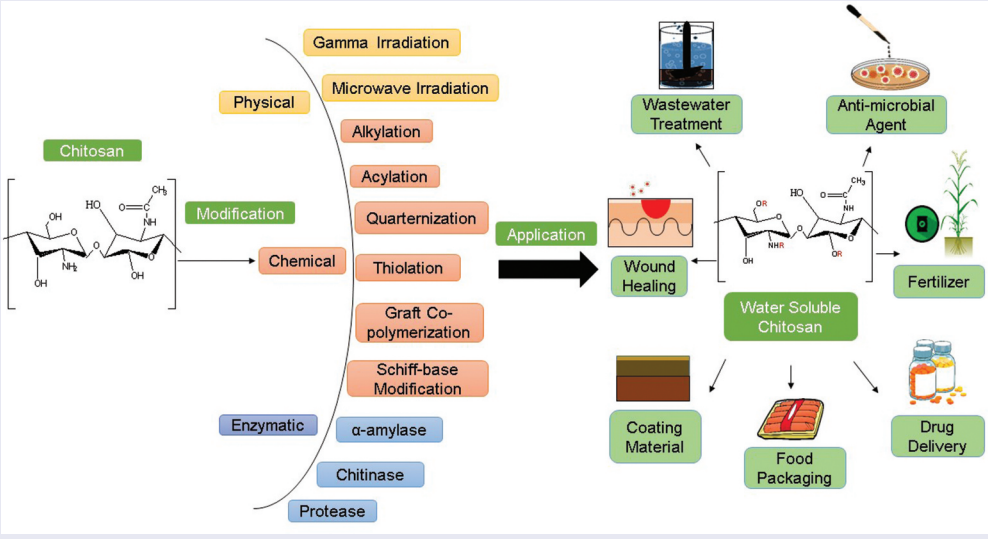
Biological properties; biopolymer; Chitin; chitosan; material synthesis; water solubility



1. Introduction

Chitosan has garnered much interest among researchers and industrial players because of its vast applications in polymer chemistry, biomedical, agriculture, and food production industries. When chitin was initially heated with potassium hydroxide (KOH) solution under reflux by Charles Rouget in 1859, he discovered that the yield was soluble in diluted acid[1]. Upon gaining popularity in the 1970s, this unique material called "chitosan" enabled the transformation of biowaste from marine crustaceans to more versatile chitosan. To date, chitosan and its wide spectrum of derivatives are applied in more than 2000 applications.[2] The use of this natural biopolymer tends to vary across various fields of application, including bioengineering,[3] agriculture,[4] wastewater

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