Abstract

Chitosan for Food Packaging Applications: A Patent Landscape Analysis [†]

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Chitosan is a biopolymer synthesized by deacetylation of chitin, a polysaccharide that can be obtained from various renewable resources, mainly waste from marine food production. Its excellent properties, including antimicrobial activity, non-toxicity, biocompatibility, and biodegradability, have made chitosan a successful material in food packaging technology. The objective of this study is to provide a patent landscape of the use of chitosan in food packaging applications. The reference database used was Espacenet, a free patent database provided by the European Patent Office (EPO). The final patent results were obtained using both classification symbols [IPC (International Patent Classification) and CPC (Cooperative Patent Classification)] and keywords in the full text, title, abstract, and claims search fields. The main relevant classification codes are listed in Table 1. A total of 2737 patent documents were obtained. After filtering the data by the earliest priority date (2003–2023), 2556 results were retrieved. China had the highest number of patents with 2154, followed by the USA with 261 and Europe with 173. The International Patent System (PCT) is frequently used by applicants and ranks second with 288 patent applications. A total of 2316 patents/patent applications were filed between 2012 and 2022. Upon analysis of the data, it was observed that many of the applications were based on chitosan blends. The most commonly claimed biopolymer blends were starch and cellulose, while the most commonly claimed synthetic polymer blends were polylactic acid (PLA) and polyvinyl alcohol (PVA). The data analysis indicates that the following materials are used: polyhydroxy alcohols, nanostructured additives, quaternary ammonium chitosan, TiO_2 and oxides/hydroxides of zinc as compounding ingredients, heterocyclic compounds with a six-membered ring containing one oxygen atom in the ring, and phenolic acids, mainly gallic, ferulic, and salicylic acid.

Table 1. List of IPC/CPC codes used in the patent search cited.

Classification Code	System	Definition
Y02W90/10	CPC	Bio-packaging, e.g., packing containers made from renewable resources or bioplastics.
B65D65/466	CPC	Bio- or photodegradable packaging materials
B65D65/463	CPC	Edible packaging materials
B32B2439/70	IPC/CPC	Food packaging
C08L5/08	IPC/CPC	Chitin; Chondroitin sulfate; Hyaluronic acid; Derivatives thereof

Table 1. *Cont.*

Classification Code	System	Definition
C08B37/003	CPC	Chitin, i.e., 2-acetamido-2-deoxy-(beta-1,4)-D-glucan or *N*-acetyl-beta-1,4-D-glucosamine; Chitosan, i.e., deacetylated product of chitin or (beta-1,4)-D-glucosamine; Derivatives thereof
C08J2405/08	CPC	Chitin; Chondroitin sulfate; Hyaluronic acid; Derivatives thereof
C08J2305/08	CPC	Chitin; Chondroitin sulfate; Hyaluronic acid; Derivatives thereof

The search query used was as follows: ((ftxt all "chitosan" AND (cl any "C08L5/08" OR cpc any "C08B37/003" OR cpc any "C08J2405/08" OR cpc any "C08J2305/08")) AND (ftxt=("food" prox/ordered "packag*") OR cpc any "Y02W90/10" OR cpc any "B65D65/466" OR cpc any "B65D65/436" OR cpc any "B32B2439/70")) OR (ctxt all "chitosan" AND (ftxt=("food" prox/ordered "packag*") OR cpc any "Y02W90/10" OR cpc any "B65D65/466" OR cpc any "B65D65/463" OR cpc any "B32B2439/70")).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are available upon request.

Conflicts of Interest: The author declares no conflict of interest.